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THE WHEAT PRICE SCARE.

THE EDITOR.

And those who husbanded the golden grain,
And those who flung it to the winds like rain,
Alike to no such aureate Earth are turned
As, buried once, men want dug up again.

Omar Khayyam—Fitzgerald.

From time to time statisticians, actuaries, students and preachers of the gospel of economy have dolefully prognosticated that with the effluxion of a few centuries, man would, as he continued to increase his progeny over the face of the Earth—completely overtake the sphere's capacity to provide him with sustenance. For the prevention of this calamity numerous theories have been prescribed, including the famous remedy of Malthus, or, not to be too pedantic, that ascribed to him. We have even been told that War, that long surviving canker of savagery in the civilised races, was a Providential happening designed to maintain the balance between man's need and the power of the Earth to supply it; yet, because there is to-day a surplus of Export Wheat in Canada, the farmer, to use a digger colloquialism, has "the wind up."

*In 1898 Sir William Crookes, a scientist of almost Universal reputation, stated that under the then existing conditions of heedless culture a scarcity of wheat was within appreciable distance; that wheat-growing land all over the world was being exhausted, and that in his opinion at some

*The Atmospheric Nitrogen Industry. Waeser—Fyleman. Foreword by J. F. Crowley, D.Sc., etc.

future time no available wheat land would be left. Crookes was then advocating the application of chemical manures to the soil—just about 30 years ago—"thus postponing the day of dearth to so distant a period that we and our sons and grandsons may legitimately live without undue solicitation for the future." The bulk of the world's average wheat production was then 12.7 bushels per acre, and the bread-eating population of the Universe was estimated at 516,500,000 people. Crookes further thought that if all the wheat-growing countries increased their cultivable areas to their utmost extent, the total, at a return of 12.7 bushels per acre, would about feed the World with its compound increase of population until 1931, and then——? With improved farming methods it might even go on until 1940.

During the intervening years much has been done in the way recommended by Sir William Crookes, and the application of superphosphates has proved of especial benefit to Australian wheat growers, while increased knowledge in the matter of dry farming and soil revitalisation has "postponed the day of dearth," yet, for the time being there is a reported surplus of wheat ready to be flooded on the immediate market, and there is a perturbed feeling amongst not a few of our farmers that wheat growing is nearing the saturation point.

That prices for wheat have fluctuated during the past few years according to seasons of plenitude and seasons of dearth may be admitted, but it must also be admitted that other factors have contributed to the fluctuation; factors not always to be found in varying seasons nor yet entirely dissociated with the get-rich-quick fraternity who have a *penchant* for various "corners." The main point is that our wheat production appears to have increased to a temporary surplus of the World's immediate requirement, and the price of the commodity may be temporarily affected thereby. It seems, however, that the demand for wheat has been increasing *parri passu* with the World's population else the price of wheat would long since have fallen in view of the increased production brought about by improved farming methods. There has been little variation during the past two decades. In the last 16 years, from 1910 to 1925, both inclusive, the mean average price for wheat in Perth has been slightly over 5s. 2d. per bushel. Is there, therefore, any need to become pannicky because of a reported surplus for export from any particular country? Is there any reason to believe that if more wheat is produced the World's markets will be limited? Is it not more likely that with increasing stocks of a valuable and palatable grain there will be an ever-increasing number of wheaten bread eaters. This is surely not an over-optimistic view if the estimate of Sir William Crookes is seriously considered, and we cannot afford to ignore the prognosis of so reputable and remarkable a scientist. Another thing worthy of consideration is that the increasing demand for wheaten bread will be governed only by the price of wheat, which will depend entirely on production costs. In a country such as Australia, and especially Western Australia, where we

have cheap land and plenty of sunlight, huge areas and modern methods of farming, there should be little fear that we cannot produce as cheaply as others. This may involve different methods of storage, handling and transport, but it is extremely doubtful if the position is nearly so acute yet as to demand conversion to silos, grain elevators and bulk handling.

Even if the gloomiest forecast were to be verified, and wheat prices were to remain at a low ebb for a season or two, it would be obviously wrong for the wheat farmer to relax his efforts of production. The lower the price the greater the necessity to produce a greater quantity from a given area, and thus make the larger volume of grain at a lower price compensate for the higher prices hitherto received for the smaller yield. In some of our districts wheat farming is as yet the only cultivation profitably possible owing to the limited rainfall and lack of water supplies for sheep, and in these areas particularly the farmer must make his best endeavours to increase the yield from his land. It is best for the farmer to concentrate on this plan of increased production, and not to unduly worry himself about the price of wheat. Experts themselves differ about the tangibility of the surplus and its effect on the World. No doubt there was a hold back of grain with a view to participation in the bonus proposed to be paid to farmers by the American Government, and the fact that this bonus is not forthcoming has released stocks and caused a sudden drop in the market price. It is notable that it has partly recovered already, and such indications as we have had during the past month are scarcely reliable. We are yet a long way from saturation point with wheat production, and seasons are apt to change and vary in different parts of wheat-growing lands, limiting the regular supply. Wheat as a commodity will hold for a long time, and can be seeped out as necessary to furnish requirements. The farmer is quite safe in renewing his energies to produce a bumper harvest this centenary year, and he need not readily read into signs of the times passing phases of supply and demand which are apt to change long before his crops are ready for the harvest.

THE POULTRY KEEPERS' MANUAL.

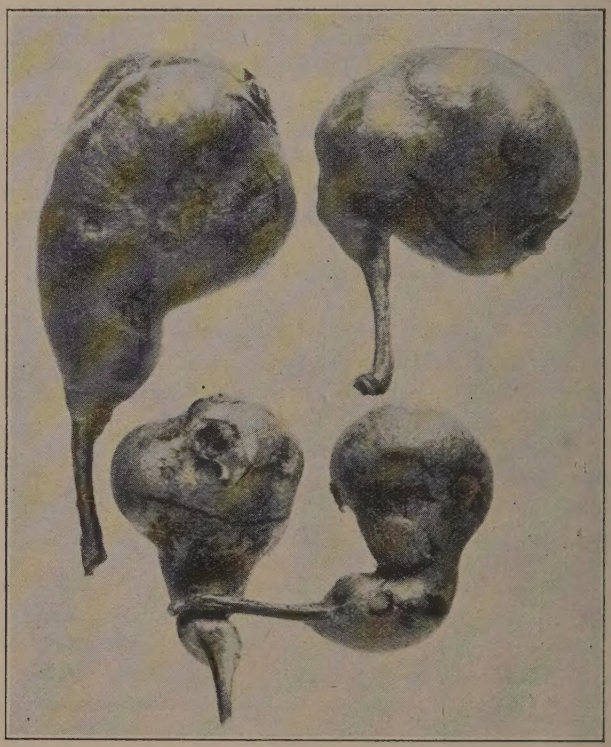
Until this issue the above Manual has appeared in our advertisement pages as being available from the Department at a cost of one shilling. Will our readers please note that the Manual is now out of print, and copies are not now obtainable from the Department of Agriculture. This notice is given in order to prevent the further forwarding of remittances in the expectation of being supplied, and thus avoiding disappointment.

PEAR SCAB

(*Venturia pyrina*).

GEO. W. WICKENS,
Superintendent of Horticulture.

Pear growers in Western Australia who shipped pears this year on consignment to Great Britain and the Continent of Europe will be pleased with the results obtained, for, in most instances, reports show that the fruit landed in sound condition and was sold at very satisfactory prices. Unlike the apple crop, the pear crop this year was below the average, and consequently



"Vicars" from unsprayed trees.

we may reasonably look forward next season to the crop being from good to heavy, and the profitable returns from the overseas markets, mentioned above, will lead to increased shipments.

To avoid disappointments and losses in connection with the expected good crop next season, it behoves all pear growers to take the necessary steps to guard against pear scab, and the experience which the Department has

had, both in the last and previous seasons, shows that when one thorough spraying is applied during the pinking stage of blooming, no appreciable loss from scab occurs, even though weather conditions during spring are favourable to the growth of the fungus.

Last year at Bridgetown Mr. Flintoff, the Orchard Supervisor, carried out a spraying test with a block of 55 trees comprising "Vicars," "Bartletts," and "Winter Nelis." Home-made Bordeaux Mixture was used at a strength of 6lbs. of bluestone and 6lbs. of best spraying lime, in 50 gallons of water. The spray was applied at pinking stage of blooming, that is, when the majority of the blossoms were showing pink, and control trees of each variety were left unsprayed. The sprayed trees produced nearly 100 per cent. of fruit free

"Winter Nelis" pears from unsprayed trees.

from scab, and the unsprayed trees produced nearly 100 per cent. of fruit so badly affected with scab as to be unmarketable. The accompanying photographs of fruit from the unsprayed trees are fair average specimens and serve to show that weather conditions were very favourable for the fungus.

When the spraying programme was outlined it was intended to spray half the trees in the block a second time, using lime sulphur at a strength of one gallon lime sulphur in 35 gallons of water after the fruit had set. When,

however, it was found that both fruit and leaves were practically free from the disease this idea was abandoned and only a few trees were sprayed to ascertain if lime sulphur at the strength named would have a burning effect on the leaves and fruit. The day selected was a cloudy one and temperatures were mild for 24 hours afterwards, but the spray seriously damaged the foliage and a big proportion of the crop fell off. It is known that when the fruit has set an application of lime sulphur at a strength even of 1 in 40 if the temperature at the time of spraying is over 75 deg. F. may cause burning of foliage and dropping fruit. It is also known that a second spraying with Bordeaux, applied after the fruit has set, will badly russet the fruit, so the absolute necessity of an effective pinking stage spray as described above is apparent.

To summarise—

(a) Pears exported this year from Western Australia to Europe and United Kingdom have, in the main, carried well and realised good prices.

(b) The pear crop of 1930 will probably be a heavy one and overseas markets will be needed to dispose of it.

(c) Pear Scab (*Venturia pyrina*) is a serious menace to the pear industry in Western Australia, as it is present in nearly every commercial pear orchard in the State.

(d) Pear Scab can be effectively controlled by thoroughly spraying with Bordeaux Mixture (6-6-50) at pinking stage of blooming.

(e) Should scab appear when fruit is set, lime sulphur at a strength not greater than one gallon of lime sulphur in 40 gallons of water can be used, but care must be exercised in choosing a time when the temperature is not more than 75 deg. F. and, if possible, when the weather is cloudy.

"THE JOURNAL OF AGRICULTURE"

will be supplied free *on application* to any person in the State who is following Agricultural, Horticultural, or Viticultural pursuits, to Agricultural Societies or Associations, and to any person otherwise interested in Agriculture.

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Editors of agricultural and country papers are invited to reproduce any of the articles contained in this *Journal*, providing the usual acknowledgment is made.

If you are not receiving the *Journal*, which is issued quarterly, and wish to do so, please forward your name and postal address to the Director of Agriculture, Perth.

BIOLOGICAL CONTROL OF THE SILVER-EYE.

(*Zosterops gouldi.*)

L. J. NEWMAN,
Entomologist.

Birds play a large part in the economy of nature. In relation to Agriculture, Fruit-Growing and Forestry, they are visible agents for good or for ill.

The feeling of man towards birds should, generally speaking, be a kindly one. The bulk of the birds are beneficial and, therefore, should be encouraged to take up their quarters in our fields and orchards.

That insectivorous birds are an important and efficient check upon insect multiplication is impossible of denial and it is doubtful if anywhere in the animal kingdom there is to be found a more important restraining influence. It is frequently found that man himself, by shooting, trapping, etc., is doing much to destroy that animal life which is of so much value to him.

The problem with which we are faced is how to cope with a bird like the one under discussion which is both beneficial and destructive—in other words it is both an insectivorous and fruit-eating bird.

The Silver-eyes are spoken of in very strong English by the majority of fruit-growers during the fruit season. Yet, if they are questioned regarding the feeding habits of these birds during the other nine months of the year, it will be found that many do not know of their insect-feeding capacity.

Silver-eyes undoubtedly cause considerable and, in some areas, very serious damage to soft fruits and grapes. The fruit-pecking habit of these birds is most disheartening. It is not so much what they eat as the amount of fruit they render unsaleable. Once a fruit is pecked it soon becomes invaded by the maggots of the ferment flies, by bees and other insects, and quickly ferments and rots. These birds move about in flocks, and consequently very quickly injure a large percentage of the fruit should they alight in an orchard containing soft fruits or grapes. A great proportion of the damage is done in the early morning hours just following sunrise.

Another objectionable feature is the eating of the fruits of noxious plants, such as the African Box Thorn and the Blackberries. They, by so doing, become potent disseminators of the seeds of these objectionable weeds.

That there are two sides to every question is a very true saying. Although it is admitted that the Silver-eyes are a great medium of loss during the soft fruit and grape season, the other side of the question must not be overlooked. During the season when fruit is not available, these birds apparently serve a definitely useful purpose in destroying many insects. This statement can be verified by taking observations of their feeding habits during winter and spring. These avians can be seen searching in a most thorough manner for aphides, scales, etc. They move from tree to tree chasing and capturing their insect prey.

Some years ago the question whether Silver-eyes should be placed on the Vermin List was discussed and dealt with by a specially appointed Board. The findings of the Board were definitely opposed to declaring these birds vermin.

To prove that Silver-eyes are insect feeders, a number were shot and the stomach contents investigated. The examination revealed the presence of scales, aphides, thrips, leaf hoppers, plant bugs, small caterpillars and various flies.

Having assessed the good and bad traits of these birds, it will be realised that it would be a fatal error to wage a war of extermination against them. No one person or thing in this world lives unto itself or gets its

Plate 1—Silver-eye (*Zosterops gouldi*).

(Photo. by Andrewartha—by kind permission of Curator of Museum, Perth, W.A.)

own way—neither the bird, the grower nor the grown; and it is a fact that, while all parties appear to demand individual rights, one from the soil, the other from the products of the garden, they are indispensable to each other in the working out of nature's great balancing plan. If it were possible to exterminate Silver-eyes we should very soon find that the balance of nature had been seriously disturbed, with the result that our last state would be worse than the first.

It is agreed that, during the fruit season, energetic measures should be adopted to keep the birds away from the fruit. To shoot or poison these birds away from the place of transgression is, in my opinion, little better than whipping a dog hours after it had committed the wrong.

The method of control which is being advocated in this article is a biological or natural one. It is common knowledge that the Butcher-bird (*Cracticus destructor*) is the natural enemy of small birds. Silver-eyes amongst others are captured by this predator and are dismembered and eaten.

Plate 2—Tyrant Butcher-bird (*Cracticus destructor*).
(Photo. by Andrewartha—by kind permission of Curator of Museum, Perth, W.A.)

The call or voice of this bird causes terror amongst smaller ones. The Butcher-birds are very pugnacious, and will attack other birds whether hungry or not. They are also insect feeders, beetles and grasshoppers forming their main insect diet. Knowing the vicious propensities of these birds against other small avians, it is proposed that they be reared and tamed in the orchard or vineyard.

During the past two fruit seasons a practical experiment of the effectiveness of the use of Butcher-birds in keeping the Silver-eyes from the orchard has been undertaken by Mr. C. Sporn, of Coolup. He claims to have solved the difficulty without having to kill a single bird valuable in its proper place.

Mr. Sporn writes as follows:—

"I reared a couple of these Butcher-birds, and about five months afterwards they proved their value. Very few small birds other than Wagtails dare to come within a quarter of a mile of my orchard or vineyard, and those that do are cleared out before they do any damage. I now get 98 per cent. of my Smyrna figs, all my grapes, soft Jap plums and prunes. I have now proved this for the past two years. Butcher-birds will attack any strange birds. When an occasional parrot comes along he is quickly driven about, and eventually clears out in disgust.

To rear Butcher-birds successfully, they must be fed on raw meat (no salt meat) all the year round. They have to be fed in the orchard several times a day. Once they know where to expect their food, there is no further trouble. The fresh meat should be cut up into small pieces and placed in a receptacle. The housewife or children can attend to the feeding of the birds.

"When taking young Butcher-birds from the nest they will need to be kept warm at night time. This is best done by providing a coverlet made with an oatmeal bag lightly stuffed with soft feathers. The birds should be kept in a large and roomy cage made with one-inch mesh netting, the larger the better. When able to fly they should be encouraged to come back to their roosting place. The birds should not be handled or caught at any time, as, if they become too tame and confident, the cats will surely capture and destroy them.

"They must be provided with plenty of water in the summer time, and a suitable vessel containing water wherein they can bathe."

Mr. Sporn, who has proved the experiment with the Butcher-bird to be so successful, has outlined the methods of rearing and feeding.

The experiment is recommended as being worthy of a good trial by other orchardists. If successful, it will be inexpensive; if otherwise, it can be discontinued at any time.

MERREDIN AGRICULTURAL SOCIETY.

FALLOW COMPETITION, 1928-29.

Judge: G. L. Throssell, Dipl.Agric, Agricultural Adviser.

From a season like the past, perhaps the most important lesson we learnt was the value of good fallow for wheat growing. That the farmers of the Merredin and surrounding districts are keenly interested in the subject is clearly indicated by the excellent number of entries received for the Fifty-Acre Fallow Competition conducted by the Merredin Agricultural Society, for which there were no less than twenty-three competitiors. With such a large number of entries, it is not surprising that, scattered as they were over the whole district, there was marked variation both in soil types and rainfall.

The points under which the Competition was judged were as follow:—

Moisture	40	points
Condition of mulch	10	„
Absence of weeds	10	„
Consolidation	20	„
Uniformity of preparation	20	„
Total	100	„

Although the schedule specified that judging should take place in January, it was not possible to commence until 26th February. This was unfortunate on account of heavy rains which fell on 16th February, and this precipitation was not uniform throughout the district. Thus it was not possible to distinguish between moisture already conserved in the fallow and that caught in the last rain, for the two had "connected." This rain, too, was an advantage to some competitors in the respect that it afforded them an opportunity of correcting defects present, which would have been detected by earlier judging.

The following table shows the rainfall recorded at centres nearest to the competitors from June until February, inclusive:—

Centre.	Fallowing rains.				Spring rains.			Summer rains.					Total June to Feb.
	June.	July.	Aug.	Total.	Sep.	Oct.	Total.	Nov.	Dec.	Jan.	Feb.	Total.	
Merredin Ex. Farm	107	224	154	485	71	19	90	...	24	50	162	236	811
Burra-coppin	116	272	175	563	81	28	109	...	35	5	181	221	893
East Goo-marin	83	182	163	328	79	18	97	12	35	18	142	207	632
Korbel ...	88	277	242	607	90	23	113	...	55	46	118	219	939
Nukarni ...	78	202	191	471	56	28	84	4	46	10	173	233	788

The winning fallow was that of Mr. T. H. Smallacombe of Nangeenan, who scored 93 points. The land originally carried salmon gum, gimlet and mallee. It was ploughed with a Sundercut in June to a depth of four inches and received two cultivations, both with a combine, the first towards the end of August, the other in September. This entry showed that care had been taken in all cultural operations, resulting in a very uniform piece of fallow.

Messrs. Robartson Bros., also of Nangeenan, were placed second, with an entry which gained 92 points. The moisture content of this entry was as good as the winning fallow, and both were ahead, in this respect, of any of the other competitors.

The following table summarises the cultural methods, and shows the points awarded to each competitor:—

MERREDIN AGRICULTURAL SOCIETY.

FALLOW COMPETITION—1928–29.

Competitor and District.	Original Timber.	Rotation.	Time of Fallowing.	Type of Plough.	Depth of Ploughing.	Condition of Land at time of Ploughing.
1—T. H. Smallacombe, Nangeenan	Salmon Gum, Gimlet and Mallee	2 years	Late June	Sundercut	4ins.	Good
2—Robartson Bros., Nangeenan	Mallee, Scrub, Salmon, White Gum, and Gimlet	2 years	Late June	Sundercut	4ins.	Good
3—W. Cook, South Walgoolan	Salmon Gum and Gimlet	2 years	Early July	Sundercut	3ins.	Good
4—F. W. Reichelt, Nth. Burracoppin	Salmon Gum, Gimlet, Mallee and Scrub	2 years	June–July	Mouldboard	3–4ins.	Fairly dry
5—F. W. Reichelt, Nth. Burracoppin	Salmon Gum, Gimlet and Jam	2 years	Mid May	Combine drill	2½ins.	Dry
6—C. H. Rowan, Korbel	Salmon Gum, Gimlet, Mallee, Jam, Scrub	3 years	Late June	Mouldboard	3–4ins	Hard
7—W. H. Cockram, Nukarni	Salmon Gum, Gimlet, Tea Tree, Jam	2 years	Mid June	Disc	3½–4in.	Good
8—J. D. Maughan, Sth. Walgoolan	Gimlet, Tea Tree, Mallee	2 years	Early June	Disc (cultg.)	3–4ins.	Good
9—T. Maughan, South Walgoolan	Salmon Gum, Gimlet	2 years	Early July	Sundercut	3ins.	Good
10—R. T. Mussared, Belka	Salmon Gum and Gimlet	2 years	June–July	Skim Mouldboard	3½ins.	Good
11—J. J. S. Cuming, Korbel	Salmon Gum and Gimlet	3 years	Early June	Scarifier	3ins.	Fairly hard
12—E. C. Biggers, Goomarin	Salmon Gum and Gimlet	2 years	July	Disc	4ins.	Good
13—A. Zwar, Nangeenan	Salmon Gum, Gimlet, Mallee, Tea Tree	2 years	July	Sundercut	4ins.	Wet
14—L. J. Meiklejohn, Goomarin	Salmon Gum, Gimlet, Jam	2 years	June	Disc	3–4ins.	Good
15—W. S. Currie, North Burracoppin	Salmon, Gimlet, Boree	2 years	Early June	Sundercut	3ins.	Good
16—R. R. Bate, North Burracoppin	Salmon Gum, Gimlet, Tea Tree	2 years	June	Cultiv. Disc	4ins.	Good
17—R. Woodhouse, East Goomarin	Salmon Gum, Gimlet and Mallee	2 years	Mid July	Sundercut	3½ins.	Good
18—G. Day, East Goomarin	Red Morrell, Gimlet	2 years	June–July	Mouldboard	3ins.	Fair
19—E. C. Parsons, East Goomarin	Morrell and Salmon Gum	2 years	July	Sundercut	3–4ins.	Fair
20—A. S. & F. Higgins, Goomarin	Morrell and Salmon Gum	2 years	July	Sundercut	3–4ins.	Good
21—L. Hawke, Nokanning	Morrell, Salmon and Gimlet	2 years	...	...	...	...
22—E. Randolph, East Goomarin	Salmon Gum, Gimlet	2 years	July	Disc	3½ins.	Fairly good
23—Woodward Bros., Goomarin	Morrell, Salmon Gum, Gimlet	2 years	Early July	Disc	3½–4in.	Good

MERREDIN AGRICULTURAL SOCIETY—*continued.*

FALLOW COMPETITION—1928-29—*continued.*

Competitor and District.	Cultivations.	Points.					
		Moisture.	Mulch.	Absence of Weeds.	Consolidation.	Uniformity of Preparation.	Total
		40	10	10	20	20	100
1—T. H. Smallacombe, Nangeenan	Combined end of August and end of September	38	8	9	19	19	93
2—Robartson Bros., Nangeenan	Cross sundercut end July. Springtyned end August, and harrowed in February	38	9	8	18	19	92
3—W. Cook, South Walgoolan	Scarified in August and September. Springtyned in January and February	35	9	9	19	19	91
4—F. W. Reichelt, Nth. Burracoppin	Harrowed after rain mid July., scarified beginning August. Harrowed end August. Harrowed (dry) in September. Combined in February	35	9	9	19	19	91
5—F. W. Reichelt, Nth. Burracoppin	Combined 3ins. first week June and in July. Scarified end August. Harrowed in September. Combined in February	34	9	9	19	19	90
6—C. H. Rowan, Korbel	Scarified and harrowed end August. Harrowed in September. Springtyned in February	35	8	9	19	19	90
7—W. H. Cockram, Nukarni	Springtyned beginning July. Sundercut end August. Springtyned in February	37	8	8	18	19	90
8—J. D. Maughan, South Walgoolan	Reploughed in July and end August. Combined in January	36	8	8	19	18	89
9—T. Maughan, South Walgoolan	Scarified in August and September. Springtyned in January and February	35	8	8	19	19	89
10—R. T. Mussared, Belka	Springtyned twice in August. Harrowed September. Springtyned October. Harrowed in February	36	8	7	19	19	89
11—J. J. S. Cuming, Korbel	Scarified mid. August. Springtyned and harrowed end August. Scarified in September	34	8	9	19	18	88
12—E. C. Biggers, Goomarin	Sundercut Aug. Springtyned (dry) November. Harrowed January, and twice February	34	8	9	19	18	88
13—A. Zwar, Nangeenan	Sundercut September. Harrowed February	36	7	8	18	17	86
14—L. J. Meiklejohn, Goomarin	Combined twice in Aug.	33	8	8	18	18	85
15—W. S. Currie, North Burracoppin	Sundercut July. Combined in August. Harrowed September and February	32	7	8	18	19	84
16—R. R. Bate, North Burracoppin	Reploughed August. Springtyned and harrowed September. Harrowed February	32	8	7	18	18	83
17—R. Woodhouse, East Goomarin	Sundercut end August. Springtyned September. Portion harrowed February	32	7	8	18	18	83
18—C. Day, East Goomarin	Springtyned August. Harrowed February	32	7	9	18	17	83
19—E. C. Parsons, East Goomarin	Combined August. Harrowed September. Springtyned February	32	7	7	18	19	83
20—A. S. & F. Higgins, Goomarin	Sundercut September. Harrowed February	31	8	7	18	18	82
21—L. Hawke, Nokanning	... ...	32	7	7	18	17	81
22—E. Randolph, East Goomarin	Sundercut September. Springtyned February	30	7	7	19	17	80
23—Woodward Bros., Goomarin	Combined August. Reploughed October Springtyned February	30	7	7	18	17	80

A little study of the above table yields some interesting information as to the competitors' methods.

Information could not be obtained from one competitor who was absent at the time of judging. Of the remaining 22 competitors, one fallowed in May, 12 in June, and 9 in July. Experiments at the Merredin Experiment Farm have definitely proved that early fallowing in June is better than late August fallowing, and it is pleasing to note that the farmers in this district are being guided by these results.

No less than sixteen competitors used disc implements for the initial fallowing operation, and of these nine were sundercuts. The mouldboard plough was used by four, while the combine and scarifier were used by one each. The type of plough used depends chiefly upon the nature of the soil and the available capital. The sundercut is favoured on account of its utility both as a plough and a cultivator. The most important point to be observed is, that whatever type of implement is employed, to be certain that it is doing the work thoroughly. This was a section under which several competitors lost points, and it was obvious after an inspection of the fallow that the initial ploughing had not been performed thoroughly. In some cases the ploughs had not been correctly set, leaving the fallow full of ridges and hollows. In others there were too many hard patches or unploughed portions, particularly along the headlands and corners.

The depth of ploughing varied between three and four inches. Experiments conducted at the Experiment Farm show that on salmon and gimlet country the minimum depth should be four inches, although no definite information is available. It is believed, however, that on the morrell types of soil the consolidation of the seed bed is less difficult to secure when the land is not ploughed so deeply, and it is considered also that the less disc implements are used on this class of country the better.

The average number of workings which the fallows received was three. Nineteen entries received their first cultivation before the end of August, and of these one was cultivated in June and five in July. Three only left their first cultivation as late as September. For this operation implements of either the spring or rigid tyne type are recommended. These implements comb the clods to the surface, allowing the finer particles to fall to the bottom, producing a firm seed bed, while the disc implements have a tendency to bury the clods and leave the seed bed too open. Other factors such as the presence of weeds, however, may necessitate the use of a disc cultivator, but it is advisable that the subsequent operation should be with a tyned implement.

It is pleasing to note that the use of harrows is becoming more general for maintaining the mulch after summer rains. The danger of working the fallow when dry is also appreciated.

It is surprising to find that of the twenty-three competitors only two are employing a three-year rotation, all the others being fallow and crop. It is expected that from the point of view of disease control a three-year rotation will shortly become more general.

Sheep were run on five fallows only. This accounts, no doubt, for the fact that several entries were rather weedy.

It is to be hoped that this competition will not only benefit the individual competitors themselves, but that by the feeling of healthy rivalry which it creates will also raise the standard in the district of firstly the fallow, and consequently the district yield.

WONGAN HILLS AGRICULTURAL SOCIETY.

FALLOW COMPETITION.

Judge: R. P. Roberts, B.Sc.(Agric.), Agricultural Adviser.

The number of entries in this Competition was extremely disappointing, there being only two competitors—Mr. J. H. Ackland and Mr. R. B. Ackland. Mr. J. H. Ackland submitted two entries for inspection, one being on light country and the other on heavy forest country. Mr. R. B. Ackland's entry was on heavy forest country. The points alloted are as hereunder:—

Competitor.	Moisture.	Consolidation.	Mulch.	Absence of weeds.	Uniformity of Preparation.	Total.
	40	20	10	10	20	100
Ackland, J. H.	39	15	9	10	19	95
Ackland, R. B.	37	18	8	10	17	90
Ackland, J. H.	35	16	6	9	16	82

The area submitted for inspection by Mr. J. H. Ackland on light land was awarded first place. The country originally carried tamma thicket and wattle. The land was ploughed during June, 1928, to a depth of 3½ to 4 inches. It was harrowed during September and cultivated with a springtyne implement in October. Immediately following a fall of nearly three inches of rain in February the area was harrowed, and it had been cultivated with a springtyne cultivator the day prior to inspection in March. The mulch was a little too fine—a defect which it is difficult to avoid in this class of soil. The moisture content was excellent, and weed growth was totally absent.

Mr. R. B. Acklands entry was on heavy forest country, which originally carried morrell timber with a little york gum and yorrell. The land was ploughed from the middle of June to the beginning of July with a four-furrow mouldboard plough to a depth of 3½ inches. It was cultivated during August with a springtyne implement and harrowed during September, and again after heavy rain in December. It was again springtyne cultivated in February after 274 points of rain.

The moisture content was good owing to prompt cultivation after the heavy rain in February. A slight depression extending across the competition area had led to the formation of several small hard patches, and in a few places where the ground had evidently been too wet when ploughed, large hard clods were in evidence. On the whole, however, the exhibit was distinctly good.

Mr. J. H. Ackland's entry on forest country was ploughed during June with a six-furrow mouldboard plough to a depth of 3½ to 4 inches. It was harrowed during September, cultivated with a springtyne implement in October, and part was harrowed and the remainder cultivated after heavy rain in February. This entry was somewhat marred by a strip which had been treated in a slightly different manner from the rest. The harrows had been

used on this portion in February, but evidently not until some little time had elapsed after the rain. The result was that the implement did little more than scratch the surface, the sub-surface remaining hard and lumpy. A springtyne implement was used on the remainder of the area, and little fault was to be found with the mulch and seed bed. The area was free from weeds, save for an occasional sucker which detracted slightly from the general appearance of the fallow.

CORRIGIN AGRICULTURAL SOCIETY.

FALLOW COMPETITION, 1928-29.

Judge: G. L. THROSSELL, Dipl.Agric., Agricultural Adviser.

Six entries were received for the Fallow Competition conducted by the Corrigin Agricultural Society.

The scale of points upon which the judging was based was as follows:—

Moisture	40	points
Condition of mulch	10	„
Freedom from weeds	10	„
Consolidation	20	„
Uniformity of preparation ..	20	„
Total ..	100	„

The rainfall recorded at Corrigin from June until February is shown hereunder:—

	Fallowing rains.				Spring rains.			Summer rains.					Total June to Feb.
	June.	July.	Aug.	Total.	Sep.	Oct.	Total.	Nov.	Dec.	Jan.	Feb.	Total.	
Corrigin ...	85	434	279	798	125	66	191	9	48	28	24	109	1.098

The Competition was won by Messrs. J. R. Bremner & Sons with an entry which scored 90 points. This particular piece of fallow, which was only a portion of a large paddock similarly worked, was causing a good deal of interest locally, by reason of the departure from the usual method of winter fallowing. The original timber on this land was a mixture of jam, york and salmon gum, gimlet and mallee. It was scarified to a depth of three inches in March, 1928, after a stubble burn, and received four workings—a springtyne cultivation in June and July, harrowed in August, and scarified and harrowed in September. This was a very uniform piece of

fallow, a mulch of desirable tilth and depth overlying a level and well-consolidated seed bed. It was free of weeds, but the moisture content was not as high as that of the entry which came second.

Mr. G. W. Rendell was placed second with 89 points. His entry was July-fallowed scrub plain, which had been ploughed to a depth of four inches with a mouldboard, and which had been cultivated with a sundercut in September and a springtyne in November. This entry had the highest moisture content in the Competition, the mulch, however, was a little deep.

The following table shows the cultural methods of the competitors and the points awarded:—

CORRIGIN AGRICULTURAL SOCIETY.

FALLOW COMPETITON—1928-29.

Competitor.	Original Timber.	Rotation.	Time of Fallowing.	Type of Plough.	Depth of Ploughing.	Condition of land at time of ploughing.
1—Bremner, J. R. & Sons	Jam, York and Salmon Gum, Gimlet and Mallee	2 years	March	Scarifier ...	3ins.	Dry
2—Rendell, G. W.	Scrub plain ...	3 yrs.	July	Mouldboard ...	4ins.	Good
3—Jenkins, R. M.	Gimlet and Morrell	2 yrs.	End June, beginning July	Mouldboard ...	4½ins.	Good
4—McAndrew, R.	Salmon Gum, Gimlet, Jam, White Gum and Mallee	2 yrs.	Early June ...	Mouldboard ...	4ins.	Good
5—Cronin, J.	Gimlet and Jam ...	2 yrs.	Early July ...	Scarifier ...	3ins.	Good
6—Ding, J. B.	Scrub plain ...	Virgin land	Early Sept. ...	Disc	5—6ins.	Fairly dry

Competitor.	Cultivations.	POINTS.					
		Moisture.	Mulch.	Absence of Weeds.	Consolidation.	Uniformity of Preparation.	Total.
		40	10	10	20	20	100
1—Bremner, J. R. & Sons	Springtyned in June and July. Harrowed in August. Scarified and harrowed in September	33	9	10	19	19	90
2—Rendell, G. W.	Sundercut in September. Springtyned in November	35	8	9	18	19	89
3—Jenkins, R. M.	Scarified in August and early in October	32	9	8	19	19	87
4—McAndrew, R.	Springtyned in September and October	34	8	8	18	18	86
5—Cronin, J.	Crossed with scarifier in July. Springtyned twice in August and a portion again in September	34	8	7	19	18	86
6—Ding, J. B.	Harrowed in November	30	7	8	16	17	78

MT. MARSHALL AGRICULTURAL SOCIETY.

FALLOW COMPETITION 1928/29.

Judge: G. L. THROSSELL, Dipl. Agric.
Agricultural Adviser.

Eight entries were received for the fallow competition conducted by the Mt. Marshall Agricultural Society, Bencubbin. Judging was commenced on February 14th, but was not completed before rain commenced on 15th. However all those competitors adjacent to Bencubbin were judged before the rain had influenced the fallows, but owing to difficulties of transport, 175 points had been recorded at Yelbeni before inspection there. This of course benefited the moisture content of that entry and had an adverse effect upon the tilth of the mulch.

The rainfall recorded at official stations nearest to the competitors from June to February was as hereunder:—

	Fallowing rains.				Spring rains.			Summer rains.					Total.
	June	July.	Aug.	Total.	Sep.	Oct.	Total.	Nov.	Dec.	Jan.	Feb.	Total.	
Bencubbin ...	53	231	148	432	66	32	98	2	51	17	84	154	684
Trayning ...	75	256	233	564	97	10	107	...	35	[illegible]	201	240	911

The scale of points upon which the judging was based is as follows:—

Moisture	40 points
Condition of Mulch	10 „
Freedom from Weeds	10 „
Consolidation	20 „
Uniformity of Preparation	20 „
	100

The competition was won by Mr. B. W. G. Hopwood whose fallow scored 89 points. The land which originally carried Mallee and Tea-tree had been ploughed to a depth of 4 inches with a disc implement (Sundercut), in July and had been springtyne cultivated in September. On account of the absence of rains of any consequence during the summer months, as the table indicates, the fallow received no further cultivations prior to judging.

The fallow which gained second place was that of Hr. G. Dunkley of Yelbeni. As explained previously this fallow had an additional 175 points of rain before it was judged, and after those in the Bencubbin area had been completed. It is not surprising therefore, that it gained the highest points for moisture content, though the condition and tilth of mulch suffered in consequence. This entry was July fallowed. the initial operation being performed with a sundercut, followed by two cultivations in October and December.

The points awarded and cultural methods are set out in the following table:—

MT. MARSHALL AGRICULTURAL SOCIETY (BENCUBBIN.)

FALLOW COMPETITION, 1928–29.

Competitor and District.	Original Timber.	Fallowing Period.	Type of Plough.	Depth of Ploughing.	Condition of land at time of fallowing.
1.—B. W. G. Hopwood, Bencubbin	Mallee and Tea-tree	July	Sundercut	4ins.	Good
2.—G. A. Dunkley, Yelbeni	Gimlet, Tea-tree, Mallee	July	Sundercut	3ins.	Good
3.—E. C. Collins, Bencubbin	Salmon, Gimlet, Jam and Mallee	June	Sundercut	3—4ins.	Good
4.—M. Collins, Bencubbin	Gimlet	July	Mouldboard	4ins.	Good
5.—W. Gobbart & Sons, Gabbin	Salmon and Gimlet	June	Sundercut	3—4ins.	Good
6.—H. Beagley, Bencubbin	Mallee, Jam and Gimlet	August	Sundercut	3ins.	Good
7.—McManus Bros. (1) North Bencubbin	Scrub	Feb., 1927	Sundercut	6ins.	Dry
8.—McManus Bros. (2), North Bencubbin	Scrub	June	Sundercut	5ins.	Good

Competitor and District.	Cultivations.	POINTS.					
		Moisture. 40.	Condition of Mulch. 10.	Freedom from weeds. 10.	Consolidation. 20.	Uniformity of Preparation. 20.	Total. 100.
1.—B. W. G. Hopwood, Bencubbin	Springtyned in September	33	9	9	19	19	89
2.—G. A. Dunkley, Yelbeni	Cultivated in October and December	36	8	8	19	17	88
3.—E. C. Collins, Bencubbin	Sundercut in July. Springtyned September	32	9	8	19	18	86
4.—M. Collins, Bencubbin	Tandem disced in January	32	8	8	19	18	85
5.—W. Gobbart & Sons, Gabbin	Springtyned September and November	32	9	7	18	18	84
6.—H. Beagley, Bencubbin	Portion sundercut, balance tandem disced in October	32	7	7	19	18	83
7.—McManus Bros. (1), North Bencubbin	Jundercut June, 1928. Tandem disced and harrowed October	30	7	6*	17	16	75
8.—McManus Bros. (2), North Bencubbin	No cultivations ...	28	6	7*	16	16	73

*Points were lost under this section for a large re-growth of suckers and scrub, etc.

The standard workings recommended for the preparation of the seed bed are:—

June, July, August.—Plough thoroughly.

September.—Cultivate with a springtyne cultivator or if weedy, skim plough.

October.—Cultivate and leave ground clean and crumbly, not too fine.

November to April.—Cultivate with springtyne or harrows after heavy rain to maintain mulch and destroy weeds.

May.—Sow seed after cultivation.

Experiments conducted at the Merredin Experiment Farm have demonstrated that considerable benefit is derived from early fallowing. The average results from early June fallow over a period of five years, are 4

bus. 26 lbs. per acre more than from late August fallow. Therefore, every farmer should endeavour to get as much of his fallowing as possible, done during the early portion of the fallowing period. In this respect, it is considered better and safer to commence fallowing early in June, rather than to prolong seeding, as experiments have definitely shown. It is important, also, to carry out the initial operation of ploughing in a thorough manner and in this regard it will be noticed that several competitors lost points. The type or make of plough used, is not as important as seeing that it is doing its work thoroughly.

When fallowing, such details as ploughing out the corners and headlands must be taken into consideration—a point which tractor farmers are sometimes inclined to overlook. A fallow with the roots and stumps in evidence is akin to submitting an ungroomed horse for judging in the show ring; this however, is perhaps the least important item.

As regards the first cultivation after ploughing, such factors as weed growth and tilth would influence what implement to use. If very weedy, it may be necessary to skim plough or turn back the fallow, but if not very bad, a springtyne cultivator or scarifier, with wide points would be suitable. Sheep are really essential for successful wheat farming, particularly in assisting to control weed growth. They also aid consolidation and return nutriment in their droppings, thereby maintaining the fertility of the soil. Only three of the competitors were sheep-owners, accounting somewhat for a fair amount of weed growth being in evidence upon the fallows inspected.

It is important that the spring cultivation should not be delayed any longer than necessary, for it is this operation which makes the mulch which should retain the moisture caught in the fallow during the winter. This cultivation which should be done with either a springtyne or scarifier, should be to the full depth of ploughing, for by so doing, the clods in the seed bed are combed to the surface—the finer particles fall to the bottom and a better consolidation is obtained. A disc implement has a tendency to bury the clods and also makes the mulch too fine. Should it not be possible to get over all the fallow with the springtyne cultivator or scarifier, a heavy set of harrows could be utilised to advantage, rather than leaving the ploughed land untouched. Subsequent cultivations should be shallower than the first, aiding consolidation, and preventing loss of moisture.

After heavy summer rains, the harrows will be found, under ordinary circumstances, to be satisfactory because firstly, they enable a large area to be covered in time to retain the moisture before it evaporates, and secondly, they aid consolidation. Care must be taken however, to ensure that the tilth does not become too fine. This is likely to occur should the harrows be used too frequently.

Experiments have proved that under conditions prevailing in our wheat belt, it is not necessary, moreover it is not profitable, to cultivate in the summer except after heavy rain. The practice of cultivating when the mulch is dry is harmful because it makes the mulch too fine and impairs consolidation, and the indications are that it aids the spread of the disease "Take-all."

In conclusion, I would like to appeal to the farmers of the Mt. Marshall district to take an active interest in the Fallow Competitions. It has been suggested that next year, the competitors and any farmers interested should accompany the judge on his tour of inspection. They could then see for themselves the good and bad points of each entry, and no doubt gain thereby useful information which they could apply themselves next season.

BRUCE ROCK AGRICULTURAL SOCIETY.

FALLOW COMPETITION, 1928/29.

Judge—G. L. Throssell, Dip. Agric., Agricultural Adviser.

Eleven entries were received for the Fifty Acre Fallow Competition conducted by the Bruce Rock Agricultural Society, and ten were submitted for inspection—the same number as in the previous year.

Judging took place between 7th March and 9th March inclusive and in this case was not affected by February rains which were very much lighter than recorded in other areas. The rainfall recorded from June until the end of February was as follows—

	Fallowing Rains.				Spring Rains.			Summer Rains.					Total. June–February
	June.	July.	Aug.	Total.	Sep.	Oct.	Total.	Nov.	Dec.	Jan.	Feb.	Total.	
Bruce Rock	79	299	173	551	83	12	95	...	45	...	55	100	746
Central Kumminin	78	368	127	573	81	22	103	...	9	11	44	64	740

It is noticeable how, after September, which was below the average, the rainfall fell off and that the district experienced another dry summer.

The same scale of points as adopted in previous years was again used this year, viz.:—

Moisture	.. .. ..	40 points
Condition of Mulch	.. ..	10 „
Freedom from Weeds	.. ..	10 „
Consolidation	.. .. ..	20 „
Uniformity of Preparation	..	20 „
Total	.. ..	100 „

The Competition resulted in Messrs. C. E. & N. S. Schilling and E. A. Ellis tying for first place, each scoring 91 points. Neither of these competitors has previously competed in this Society's Fallow Competition and they are to be congratulated upon carrying off the honours.

Messrs. Schilling's entry was early June fallow which had been ploughed to a depth of 3-4 inches with a disc implement (Sundercut). This fallow received four workings, three in the winter months, subsequent to ploughing and one in the spring. The first was a harrowing in June. The land was then scarified early in June and springtyne cultivated towards the end of the same month and again in September. This exhibit was very uniform. It was not quite as high in moisture content as that of Mr. Ellis but the mulch was very even, overlying a level well consolidated seed bed. The mulch, if anything, was a little on the fine side as regards tilth. There were very few weeds present.

The other winning exhibit, that of Mr. E. A. Ellis of Central Kumminin, was also an early June fallow, the initial operation being carried out with a disc implement (Sundercut) to a depth of 3 inches. This was followed by three cultivations—a harrowing in July, a disc cultivation (Sundercut) towards the end of July and springtyne cultivation early in

August. There was a slight crust on the surface of the mulch, a fault which could have been remedied by a harrowing. In other respects this fallow was equal to the other winning entry and in fact, as previously mentioned, was higher in moisture content.

The following table shows the cultural details and points awarded to the competitors—

BRUCE ROCK AGRICULTURAL SOCIETY.

FALLOW COMPETITION, 1928-29.

Competitor and District.	Original Timber.	Rotation.	Time of Fallowing.	Type of Plough.	Depth of Ploughing.	Condition of land at time of Fallowing.
		years.			inches.	
1.—C. E. & N. S. Schilling, Bungulluping	Salmon and Gimlet	3	Early June	Sundercut	3—4	Good
2.—E. A. Ellis, Central Kumminin	Salmon, Gimlet, Jam	2	Early June	Sundercut	3	Good
3.—Buller and Black, Babakin	Salmon, Gimlet, Morrell	2	Late June	Sundercut	3	Good
4.—R. Mann, South Shackleton	Gimlet, Tea-tree	3	Late July-August	Mouldboard	3—4	Good
5.—P. McCarthy and Son, Eujinya	Gimlet	2	Early June	Disc	4½	Good
6.—F. C. Farrall and Sons, Yarding	Salmon Gum, Mallee, Jam, Gimlet	3	Late June	Disc	3—4	becoming hard
7.—S. A. Brown, Bungulluping	Salmon, Gimlet	2	July	Scarifier	3—4	Good
8.—E. M. K. and C. Allen, Central Kumminin	Salmon, Gimlet	2	June	Scarifier	3	Good
9.—W. D. Johnson, Bruce Rock	Salmon, Gimlet	2	July-August	Mouldboard	4	Good
10.—G. E. Robins & Co., Babakin	Salmon, Gimlet, Morrell	2	End Jan.	Disc	4	Dry

Competitor and District.	Cultivations.	Points.					
		Moisture.	Mulch.	Absence of weeds.	Consolidation.	Uniformity of preparation.	Total.
		40.	10.	10.	20.	20.	100.
1.—C. E. & N. S. Schilling, Bungulluping	Harrowed June, scarified early July. Springtyned end July and September	35	9	9	19	19	91
2.—E. A. Ellis, Central Kumminin	Harrowed July. Sundercut end July. Combined early August	36	8	9	19	19	91
3.—Buller and Black, Babakin	Springtyned August. Portion scarified end Septemper. Balance springtyned	34	8	8	19	19	88
4.—R. Mann, South Shackleton	Springtyned September. Scarified and harrowed early October	35	7	8	19	18	87
5.—P. McCarthy & Son, Eujinya	Sundercut early August. Springtyned early October and February	34	7	8	19	19	87
6.—F. C. Farrall & Sons, Yarding	Springtyned late July. Sundercut September. Harrowed January.	34	7	9	19	17	86
7.—S. A. Brown, Bungulluping	Scarified September. Springtyned October	33	8	9	18	18	86
8.—E. M. K. and C. Allen, Central Kumminin	Scarified August. Combined September.	34	7	8	19	18	86
9.—W. J. Johnson, Bruce Rock	Springtyned August-September	33	7	9	18	18	85
10.—G. E. Robins & Co., Babakin	Scarified mid. July. Harrowed August. Springtyned September. Harrowed October	32	8	6	18	19	83

An improvement was noticed this year as regards the time of fallowing. This year six competitors fallowed in June and three in July as against two in June last year and six in July. One competitior fallowed dry in January using a disc plough. It is to be hoped that a similar improvement will be evident next year, by which time perhaps all the fallows in the competition will be June fallows. "June fallow means better fallow; Better fallow means bigger yields" as indicated by experiments carried out in this direction at the Merredin Experiment Farm.

The sundercut (a disc implement) is still the most popular implement, although scarifiers are proving themselves very suitable machines for working the fallows.

It was noticed that discs are being used on Morrell land or land which originally carried an admixture of Morrell. This is not recommended on account of the difficulty of controlling the depth. Much harm can be done to Morrell land, particularly in the early stages, by working it too deeply and it sometimes takes years to remedy. It is not at all advisable to work Morrell land dry.

One of the chief faults with the fallows in this year's competition was the lack of uniformity of preparation. There were too many hard patches in evidence.

Mustard and barley grass were also fairly prominent on some fallows. The latter is a particularly bad weed as it harbours "Take-all." Sheep will eat it in the early stages when the weed is young.

SEED TESTING BY THE DEPARTMENT OF AGRICULTURE.

The Seed Testing Laboratory of the Department of Agriculture is prepared, as far as facilities will permit, to receive seeds for the purpose of making tests for both germination and purity (which includes the determining of the percentage of pure seed, and of weed seeds, including dodder). Samples should not be less than 2oz. in weight and should be addressed to the Plant Pathologist, Department of Agriculture, Perth. All particulars should accompany same, such as name and address of seller, and of sender; also year and place of growth and price paid. The charges for testing samples are—

(1) Complete test—6s.
(2) Purity only—4s. 6d.
(3) Germination—2s. 6d.

NUNGARIN AGRICULTURAL SOCIETY.

FALLOW COMPETITION, 1928/29.

Judge: G. L. THROSSELL, Dipl.Agric., Agricultural Adviser.

For the Fallow Competition conducted by the Nungarin Agricultural Society seventeen entries were received, and of these fourteen were submitted for inspection, one less than last year. Of these there were three competitors who had not previously entered for the competition. The district was well represented in regard, not only to the distribution of the competitors and the class of land, but also in respect to the high standard of fallow. The judging was based on the same scale of points as in previous competitions, namely:—

Moisture	40 points
Condition of mulch	10 „
Freedom from weeds	10 „
Consolidation	20 „
Uniformity of preparation ..	20 „
Total ..	100 „

The competition was judged between 19th and 22nd February, which was rather soon after a fairly general rain on 15th and 16th February. Under the circumstances, however, it was not possible further to delay judging. Some of the competitors (five) had not taken advantage of this rain to give the fallow a further cultivation. Four competitors situated in the Mukinbudin and Lake Brown districts, however, did not receive sufficient rain to warrant another cultivation, and in consequence were at a disadvantage as far as moisture content was concerned.

The rainfall recorded at official stations nearest to the competitors was as follows:—

	Fallowing rains.				Spring rains.			Summer rains.					Total Rainfall June to Feb. 19th.
	June	July	Aug.	Total.	Sep.	Oct.	Total.	Nov.	Dec.	Jan.	Feb.	Total.	
Nungarin ...	78	223	185	486	59	4	63	1	43	4	144	192	741
Talgomine ...	53	217	139	409	49	19	68	3	12	14	125	154	631

From the foregoing table it will be seen that after August no rains of any consequence fell until the week prior to judging—the registrations in September being chiefly in the nature of light showers spread over several days. It is therefore pleasing to note that nearly all the competitors cultivated their fallows almost immediately after ploughing and again early in

the spring, forming thereby an effective mulch, which, in the absence of summer rains, meant it was unnecessary to cultivate the fallows when dry. Thus it can be seen that a high standard of farming practice has been reached in this district.

The competition was won by Mr. G. T. Young, of Talgomine, whose entry gained 92 points. This fallow was salmon and gimlet country, which had been ploughed early in June with a mouldboard plough to a depth of 4 inches, and had received four cultivations. It was disced (sundercut) in August, scarified (with harrows behind) in September, in which month it was also springtyne cultivated (with harrows behind), and received a final harrowing after the mid-February rains. This fallow was indeed a credit to the competitor, and after inspection it was evident that all operations had been thoroughly performed. The mulch was in good tilth, and the seed bed level, but the consolidation might have been better.

Mr. F. A. Williams, of Mangowine, with a late June fallow gained second place, scoring 91 points. This entry was of particular interest, because the only implements used were a scarifier and a set of harrows. The land was scarified to a depth of three inches late in June. Harrows were attached behind this implement. The fallow received another scarifying in August, but received no further cultivation. The mulch, consolidation and thoroughness of preparation were good, but a few weeds, chiefly Potato Weed, were in evidence.

The following table summarises the cultural methods, and shows the points awarded to the competitors:—

NUNGARIN AGRICULTURAL SOCIETY.

FALLOW COMPETITION, 1928–29.

Competitor and District.	Original Timber.	Rotation.	Time of Fallowing.	Type of Plough.	Depth of Ploughing.	Condition of land at time of ploughing.
1.—G. T. Young, Talgomine	Salmon Gum, Gimlet	2 years	Early June	Mouldboard	4ins.	Good
2.—F. A. Williams, Mangowine	Salmon Gum and Gimlet	2 years	Late June	Scarifier	3ins.	Good
3.—J. H. Johnson, Mangowine	Salmon Gum and Gimlet	2 years	End June–July	Disc	4ins.	Good
4.—Watson, Bros., Nungarin	Salmon Gum and Gimlet	2 years	July	Sundercut	4ins.	Fair
5.—R. C. Fitzpatrick, Nungarin	Salmon, Gimlet, Morrell, Jam	2 years	July	Sundercut	4ins.	Good
6.—Creagh, Bros., Quelkan	Salmon, Gimlet, Morrell	2 years	June	Disc	3ins.	Hard and dry
7.—G. H. Herbert, Nungarin	Morrell, Salmon, Gimlet	2 years	Mid June	Scarifier	2ins.	Hard, very dry
8.—A. G. Reynolds, Mukinbudin	Salmon, Gimlet, Mallee, Jam and Scrub	3 years	Early June	Sundercut	3½ins.	Good
9.—H. J. Muhs, Nungarin	Salmon Gum and Gimlet	2 years	July	Sundercut	4ins.	Good
10.—L. Dumsday, Talgomine	Gimlet and Tea Tree	2 years	March 1928	Disc	4ins.	Dry
11.—H. P. Jolly, Mangowine	Morrell, Salmon Gum and Gimlet	2 years	July	Mouldboard	4ins.	Good
12.—J. Mulqueeny, Lake Brown	Salmon Gum and Gimlet	2 years	Early July	Sundercut	3ins.	Good
13.—W. J. Duthie, Mukinbudin	Salmon Gum and Gimlet	2 years	July	Disc	3ins.	Good
14.—J. Richardson, Nth. Mukinbudin	Blackbutt, Tea Tree, Salmon Gum	2 years	June–July	Disc	4ins.	Good

NUNGARIN AGRICULTURAL SOCIETY—*continued.*

FALLOW COMPETITION, 1928-29—*continued.*

Competitor and District.	Cultivations.	Points.					
		Moisture.	Mulch.	Absence of weeds.	Consolidation.	Uniformity of Preparation.	Total.
		40.	10.	10.	20.	20.	100.
1.—G. T. Young, Talgomine	Sundercut end of August. Scarified and harrowed September. Springtyned and harrowed end of September. Harrowed in February	37	9	9	18	19	92
2.—F. A. Williams, Mangowine	Harrowed behind scarifier and scarified and harrowed in August	36	9	8	19	19	91
3.—J. H. Johnson, Mangowine	Springtyned end of July and end of August	36	9	8	19	18	90
4.—Watson Bros., Nungarin	Combined in October	35	8	9	19	18	89
5.—R. C. Fitzpatrick, Nungarin	Springtyned in September, rolled and harrowed in October. Harrowed in February	35	8	8	19	19	89
6.—Creagh Bros., Quelkan	Skim ploughed early September. Combined end of September	35	8	8	19	18	88
7.—G. H. Herbert, Nungarin	Scarified July and again in August. Harrowed in February	35	8	7	19	19	88
8.—A. G. Reynolds, Mukinbudin	Combined end of July and September. Light harrows behind implement	34	8	8	19	19	88
9.—H. J. Muhs, Nungarin	Sundercut end of August. Springtyned (portion) in February	34	8	8	19	18	87
10.—L. Dumsday, Talgomine	Reploughed early August (dry)	33	8	8	18	18	85
11.—H. P. Jolly, Mangowine	Harrowed August. Springtyned end of October. Harrowed in February	32	7	8	19	18	84
12.—J. Mulqueeny, Lake Brown	Springtyned Mid August. Harrowed end August. Harrowed January	32	7	8	19	17	83
13.—W. J. Duthie, Mukinbudin	Springtyned in August and October	30	8	7	18	19	82
14.—J. Richardson, Nth. Mukinbudin	Portion reploughed in August	31	7	9	17	17	81

A review of the data in the above table reveals that the competitors appreciate the value of early fallow, for all the competitors fallowed during June and July with the exception of one entry, which was disced dry in March, 1928.

The disc type of plough was used by ten competitors, five being sundercuts. Two used mouldboards, one of which was used in preparing the winning fallow, and two favoured the scarifier. Discs are not good implements to use on land of the morrell type on account of difficulty of keeping them from going in too deep. The scarifier on the other hand, is proving to be a very suitable machine for that class of country.

The fallows this year were rather weedy, Mustard and Barley Grass being chiefly in evidence, while the Potato Weed was present on a few fallows. It is very difficult economically to control weeds without the aid of sheep, and only six competitors owned sheep. However, now that the district is being reticulated with water from the several rock catchments, it is expected that there will be a big increase in the numbers of sheep.

It is surprising to find that only one competitor is farming on a three-year rotation. This may be due to some extent to the lack of sheep. The diseases "Take-all" and Flag Smut are both becoming prevalent, and the best way to eradicate them is to adopt a rotation including a change crop, such as oats, to starve the diseases out. To render the oats a commercial proposition, sheep are necessary.

DOODLAKINE-BAANDEE FALLOW COMPETITION, 1928-29.

Judge: A. WILD, B.Sc.(Agric.), Agricultural Adviser.

The fallow competition conducted by the Doodlakine-Baandee Agricultural Society during 1929 was characterised by an unusual condition, viz., that the area of fallow of each entry was to be not less than one quarter of the total area of cultivable land held by the competitor. The object of this condition is to stimulate a wider interest in the whole of the fallowed land, rather than in a small area of 50 acres to which special attention can be given. Since the fallow inspected for each competitor was frequently in more than one paddock, the work of the judge became somewhat complicated. In some cases the same competitor submitted, as the one entry, paddocks which had received different cultivations, and in consequence were in different conditions of preparation. It was found necessary to pay due regard to this, and consequently to award points to each paddock as a separate entry and then to arrive at an everage for the whole of the entry.

The fallows were inspected on the 6th and 7th of March. The monthly rainfalls as recorded at Doodlakine and Baandee from June, 1928, to February, 1929, as shown hereunder:—

	1928.							1929.	
	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.
Doodlakine ...	76	273	101	73	13	...	97	...	169
Baandee ...	53	244	165	49	11	...	9	...	*

* No record available.

The awards were made as follow:—

DOODLAKINE-BAANDEE AGRICULTURAL SOCIETY.

FALLOW COMPETITION, 1929.

Competitor.	Address.	Moisture 40 points.	Mulch, 10 points.	Absence of weeds, 10 points.	Consolidation of seed bed, 20 points.	Uniformity of Preparation, 20 points.	Total, 100 pts.
1.—F. Birch	Baandee ...	35	9	10	16	19	89
2.—Prowse Bros. ...	Doodlakine ...	35	8	8	18	17	86
3.—A. E. C. Prowse ...	Doodlakine ...	34	8	8	17	17	84
4.—R. Barton & Sons ...	Baandee ...	34	8	7	17	17	83
5.—H. Birch	Baandee ...	34	8	8	16	17	83
6.—E. W. Prowse ...	Doodlakine ...	34	7	8	16	16	81
7.—H. Mableson & Sons	Baandee ...	28	7	7	17	17	76
8.—D. J. Spillman ...	Baandee ...	28	7	7	17	16	75

The cultural and other details of the fallows inspected are set out in the table hereunder:—

DOODLAKINE-BAANDEE AGRICULTURAL SOCIETY.

FALLOW COMPETITION.

Competitor.	F. Birch.	Prowse Bros.	A. E. C. Prowse.	R. Barton & Sons.
Cultivable area ...	1,400 acres.	4,300 acres	1,220 acres	1,570 acres
Total area of fallow	700 acres	1,240 acres	490 acres	700 acres
Area of fallow inspected	350 acres	1,090 acres	400 acres	400 acres
Land and timber...	Salmon Gum and Gimlet	Salmon Gum, Gimlet, Mallee and scrub	Salmon Gum, Gimlet, with some Mallee and White Gum	Salmon Gum, York Gum and tea-tree
Fallowing period ...	June and July	June and July	June and July	July to Sept.
Type of Plough ...	Mouldboard	Mouldboard and Disc	Mouldboard and Disc	Disc.
Depth of ploughing	3—4ins.	3½ins.	3½ins.	4ins
Sheep	Yes	Yes	Yes	Yes
	Springtyne cultivated to full depth of ploughing in August. Rolled in January. Scarified in February after rain.	*Paddocks* 1 and 2: Springtyne cultivated and rolled in August. Harrowed in February. *Paddock* 3: Springtyne cultivated in August. Disc cultivated in September. Portions rolled, and all harrowed in February. *Paddock* 4: Disc cultivated in August, and portion in September. Harrowed in February.	Springtyne cultivated at end of March.	Scarified in August. Springtyne cultivated in October. Harrowed in February.

Competitor.	H. Birch.	E. W. Prowse.	H. Mableson & Sons.	D. J. Spillman.
Cultivable area ...	1,400 acres	1,600 acres	1,600 acres	2,400 acres
Total area of fallow	680 acres	600 acres	640 acres	900 acres
Area of fallow inspected	350 acres	400 acres	400 acres	600 acres
Land and timber	Salmon Gum, Gimlet and some Mallee	Salmon Gum and Gimlet	Salmon Gum and Gimlet with some Morrel	Salmon and Gimlet. Scrub and Mallee
Fallowing period ...	July	June and July	June	June—August
Type of Plough ...	Mouldboard	Disc	Duckfoot Cultivator	Disc
Depth of ploughing	3½—4ins.	3½ins.	2in.	3½ins.
Sheep	Yes	Yes	No	Yes
	Cultivated in September and again in October with springtyne and scarifying implements.	Springtyne cultivated in August and portion in February.	Springtyne cultivated in August and again in September and October.	Disc cultivated in September.

Mr. F. Birch secured first place with 350 acres of fallow, which had been ploughed to a depth of three to four inches during the previous June and July with a mouldboard plough. Immediately this operation was completed, the land was cultivated to the full depth of ploughing with a springtyne implement. A deep cultivation with a springtyne implement tends to bring the clods to the surface and allows the finer soil particles to reach the bottom of the fallow to form the seed bed, which in time becomes satisfactorily compacted. Care should be exercised that subsequent cultivations do not disturb this seed bed.

Mr. Birch's fallow was rolled in January to break up the surface clods. In February it was scarified after rain had fallen. The entry was fairly high in moisture content, had a well prepared surface mulch, and practically no weeds were apparent. The uniformity of the preparation of the whole of this entry is worthy of favourable comment.

Messrs. Prowse Bros. entry, which was awarded second place, comprised about 1,100 acres which had also been ploughed during the previous June and July, when both disc and mouldboard ploughs were used. The major portion had been springtyne cultivated in August, but on a portion the disc implement had replaced the springtyne. Subsequent to the August cultivation a portion had been rolled and the remainder disc cultivated. Practically the whole area had been harrowed in February after rain. Quantities of "Prickly summer weed" (*Solanum hoplopetalum*) were noticed in two of the smaller paddocks, but the remainder of this entry was comparatively free of weed growth. The harrows had left a fair mulch although a little too flat. One of the advantages of using the springtyne implement in preparing and maintaining a mulch lies not least in the fact that the soil is left slightly ridged, consequently, after rain, a cross cultivation of the land thus prepared is more effective in reforming the mulch to the desired condition.

It is pleasing to note that most of the competitors in this fallow competition utilise the services of sheep before and during the fallowing period to control weed growth. The aim of the competitors was to plough their land for fallow as early as possible, preferably in June or July. The recognition of this practice as an aid to greater fertility and productivity is gratifying in the light of the results of experiments conducted by the Department of Agriculture.

The dry spring of 1928 was not favourable to frequent cultivations during that period. The cultivation of fallow in the dry state is inadvisable, not only is it thought to assist in the spread of "Take-all," but usually no good results can be achieved by the practice. Consequently, the number of cultivations, prior to the inspection and subsequent to the initial ploughing, varied from one to three. A cultivation in spring and another after February rain was deemed by most of the competitors to be sufficient.

POTATO DISEASES IN WESTERN AUSTRALIA.

H. A. PITTMAN, B.Sc.Agr.,
Plant Pathologist.

INTRODUCTION.

According to the figures given by the Government Statistician in Part 5 of the "Statistical Register of Western Australia" for the Seasons 1921-2 to 1927-28, both inclusive, the average annual area under potatoes during this period was 4,543 acres, with an average yield over the whole period of 3.7 tons per acre.

The figures for the various seasons mentioned were as follows:—

Season.*	Acreage.	Yield per acre in tons.
1921-2 ..	3,612 ..	3.8
1922-3 ..	3,620 ..	4.2
1923-4 ..	4,761 ..	3.7
1924-5 ..	5,122 ..	3.9
1925-6 ..	4,262 ..	3.8
1926-7 ..	5,143 ..	3.5
1927-8 ..	5,279 ..	3.2
1921-8 ..	4,543 ..	3.7

Such a low average yield is undoubtedly due in a large measure to the prevalence of diseases of various kinds. This is borne out by the fact that the average yield obtained by growers using Government-certified seed since the inception of the Seed Certification Scheme, three years ago, as computed by Mr. G. N. Lowe, Senior Potato Inspector, has been from 8-10 tons per acre. Where the manurial and cultural treatments have been identical, certified seed has constantly given a yield of from four to five tons per acre over that of non-certified seed grown alongside. This is very largely due to the elimination of virus and other diseases in the process of producing the certified seed. In fact the elimination of disease, in so far as may be humanly possible, constitutes the chief "raison d'être" or justification for the existence of the Seed Certification Scheme. Yields as high as approximately 23 tons per acre have been obtained by the use of certified seed. This seed is now being grown over an area of approximately 1,000 acres with most gratifying results.

Up to date the highest yield recorded for Western Australia has been obtained by the use of certified seed, and was at the rate of 23 tons 7 cwt.

**For the purpose of the statistical records, the season is taken as commencing on the 1st March in each year.*

per acre, the same grower having taken 40 tons off two acres. Such yields are, of course, only obtained by a combination of the following factors:—

1. Suitable soils and localities.
2. Seed selection—preferably the use of Government-certified seed.
3. Seed disinfection before planting.
4. Racking of the tubers to secure sprouted seed.
5. Careful preparation of the soil, including adequate drainage.
6. Adequate manuring.
7. Careful cultivation during the growth of the crop.
8. Intelligent use, when required, of spray mixtures to control such diseases as Early and Irish Blight.

DISEASES.

The following diseases of potatoes have been recorded on potatoes in this State. The cause and control measures to be adopted for each are described hereafter.

Name of Disease and Cause.

Rhizoctonia Scab, Canker or Rosette—*Rhizoctonia solani.*
Common Scab—*Actinomyces scabies.*
Eelworm Scab—*Heterodera radicicola.*
Silver Scurf—*Spondylocladium atrovirens.*
Dry Rot, Brown Ring or Fusarium Wilt—*Fusarium oxysporum.*
Early Bight—*Macrosporium solani.*
Bacterial Wilt (Wet Rot)—*Bacillus solanacearum.*
Irish Blight—*Phytophthora infestans.*
Blackleg—*Bacillus atrosepticus.*
Mosaic—Ultramicroscopic parasite (virus).
Leaf-roll—Ultramicroscopic parasite (virus).
Streak—Ultramicroscopic parasite (virus).
Hollow Heart—Excessive rate of growth in coarse varieties.
Fleck (Internal Brown Spot or Sprain)—Unknown.
Hot Formalin injury—Tubers left covered too long after treatment.

1.—RHIZOCTONIA SCAB, ROSETTE OR STEM CANKER.

(Caused by *Corticium vagum* B. & C.—*Rhizoctonia solani,* Kuhn.)

This disease is the most widespread of all potato diseases, and it has been recorded from every part of the world where potatoes are grown commercially. The fungus responsible for the trouble is known scientifically by either of the two names given above. The first name is applied to the fungus when in the sexual condition, while the second name is that which is applied to the fungus in its much more common sterile condition. Many other plants beside the potato are attacked, and amongst those which have been recorded in various parts of the world are beets, carrots, lucerne, red-clover, onion, raspberry, turnips, peas, celery, lettuce, beans, cabbage, carnations, parsnip, rhubarb, violets and spinach (Chupp, 1925). In America losses ranging from 5 to 50 per cent. of the potato crop in various districts have often been recorded on account of the ravages of this parasite. In

Western Australia the disease has only become of serious moment during the past few years, as Herbert in 1920 stated that "*Rhizoctonia* is not common here though frequently found in imported potatoes." To-day it ranks with such diseases as Mosaic and Leaf-Roll as one of our most potent and persistent causes of loss.

Symptoms shown by affected plants.

The disease is best known to the grower and to the general public as hard, sooty-black scabs or fungus-bodies on the surface of the tubers, which will not readily rub or wash off. These black bodies, which really represent resting stages in the life history of the fungus, are frequently very numerous and give the affected tubers the appearance of having been more or less thickly sprinkled with irregular drops of molten pitch or tar. (See Fig 1.)

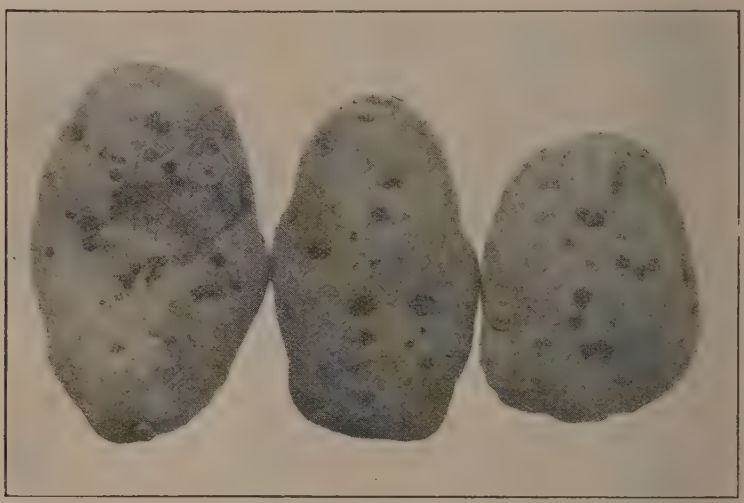

Fig 1.—(Potato Diseases in W.A.)
Potato tubers showing black *sclerotia* of *Rhizoctonia solani.*
(Photo. by Author.)

They are known as *sclerotia,* and may vary in size from mere pinpoints up to huge structures occasionally covering an area of several square inches. As they do not penetrate the skin, they are in consequence removed when the tubers are peeled. Nevertheless, their presence is detrimental to the market value of the tubers, as they considerably detract from their appearance. Their presence on seed tubers is, however, fraught with a far greater potentiality for evil than in the case of tubers sold merely to be consumed. When infected tubers are planted the *sclerotia* give rise to brown fungus threads which work their way along the surface of the tubers, or through the soil, to the young potato shoots and proceed to attack them at the tips or else lower down, causing a dark brown or black canker (see Fig. 2). The result is that many of the shoots are killed, and a greatly reduced stand may result. *This constitutes the most serious aspect of the Rhizoctonia*

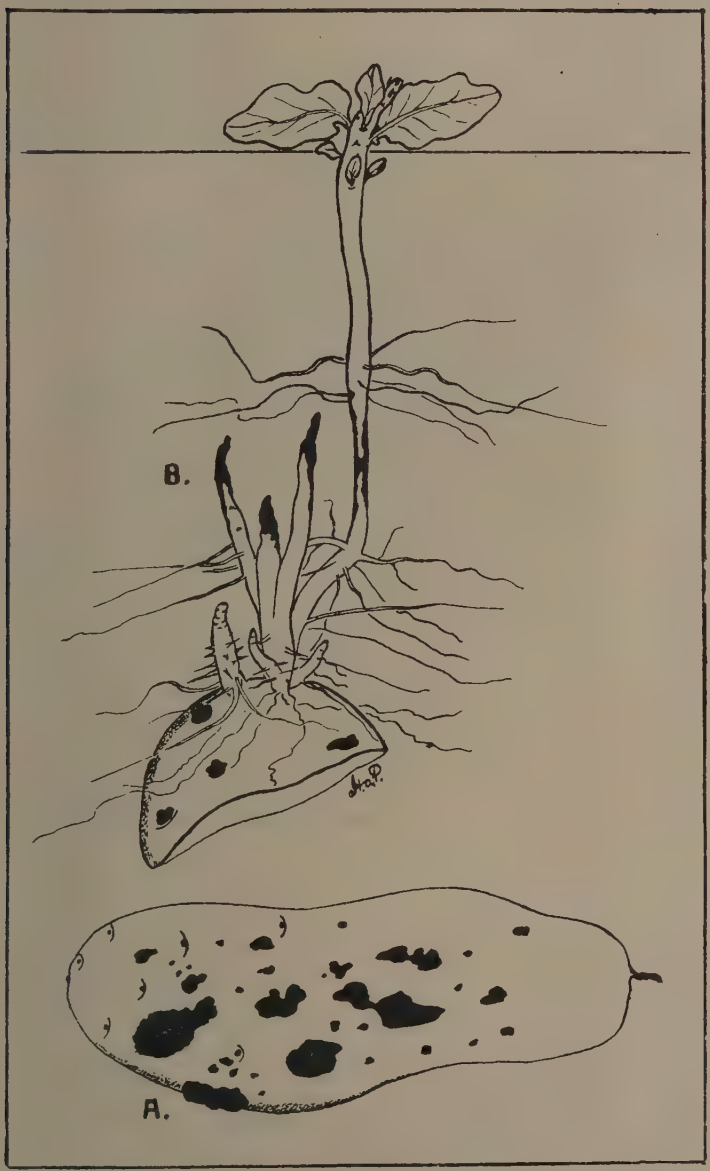

Fig. 2.—(Potato Diseases in W.A.)

A.—Potato tuber showing bad attack by *Rhizoctonia*.

B.—Germinating set showing the killing-back of the sprouts and stem-cankering which occurs when *Rhizoctonia*-infested tubers are planted. *The resultant missing hills or weakling plants constitute the most serious aspect of the Rhizoctonia disease.*

(Drawing by Author.)

Disease. The attacked shoots often throw out new buds lower down, and these may in turn be attacked. This attacking and renewed growth may be repeated a number of times until the sprout is finally killed altogether, resulting in a missing hill, or the plant may break feebly through the soil a long time after the healthy hills are up. These weakling yellow plants can never yield a profitable return.

If the base of the stem is not infected until the plant has gained considerable size, it may not be killed but a shortening of the internodes at the growing point may result (as a consequence of the reduced water supply, etc., reaching the growing tissues), and a massed or rosette effect may be given to the topmost leaves. These leaves may turn yellow or remain the normal green. Where the canker on the stem does not penetrate deep enough to shut off or reduce the supply of water and dissolved minerals, but does penetrate deeply enough to interfere with the movement of sugars down to the tubers, there may result an accumulation of plastic food materials in the top of the plant. In an endeavour to propogate itself, or at least find an outlet for this accumulation of food materials, tubers known as "aerial tubers" may be formed in the leaf axils on the above ground parts of the stems. In very wet weather the fungus may form a white cob-webby sheath of threads about the base of the stem. This is the reproductive stage of the fungus known as *Corticium vagum*. So far this stage has not been recorded in Western Australia.

It is said that *Rhizoctonia* may cause pitting of the surface of the tubers, but this seems to be very doubtful. The fungus is also accused of causing a "jelly-end rot" where the tubers are abnormally elongated at the stem end.

General Considerations.

Rhizoctonia attack is greatly influenced by the environmental conditions. In this connection temperature often appears to be the most important factor. The temperatures at which the fungus does most injury are between 59-70° F. Other things being propitious the fungus is most destructive at a soil temperature of 64° F. It thrives best in acid soils, and on this account liming gives good results in its control. Unfortunately the position is complicated by the fact that Common Scab (*Actinomyces scabies*) is *favoured* by liming, and so in avoiding *Rhizoctonia* in this way, one encourages *Actinomyces*. In spite of the fact that acidity favours *Rhizoctonia*, heavy dressings of farm-yard manure, or organic matter such as green manures, appear to considerably reduce the occurrence of the disease. Fortunately the same appears to be true of *Actinomyces*. In both cases the provision of abundant dead organic matter seems to divert the unwanted attentions of the parasites into other more desirable channels.

Control.

As *Rhizoctonia* is at present so very widespread, and as it may be present on the tubers as a fine, branched, mass of threads which can only be detected by the microscope, all seed-tubers should be treated as if *Rhizoctonia* were definitely known to be present.

The following measures are recommended for its control:—

1. Wherever possible practise rotation of crops. This is one of the most effective means of controlling any plant disease. Cereal crops, such as wheat, barley, oats, rye, maize and sorghum are not susceptible to *Rhizoctonia* attack.

2. Use only selected, *Rhizoctonia*-free, seed-tubers. Best of all, use Government-certified seed. This is obtained from the cleanest, heaviest-yielding crops in the country, and contains only the ineradicable minimum, if any, of such diseases as Mosaic, Leaf-roll, Thready-eye, *Rhizoctonia,* Common Scab, Potato Moth, Irish Blight, etc.

3. Harvest as soon as mature to prevent increase in the number of *sclerotia* on the surface of the tubers.

4. Religiously disinfect all seed tubers before planting, irrespective of their source of origin, in one or other of the following ways:—

A.—*Hot Formalin Dip*—

Dip the tubers in a solution of formalin made from 1 quart of formalin to 30 gallons of water and heated to 120° F. Keep the tubers immersed *for two minutes,* and then place in heaps under bags damped with the formalin solution *for one hour only.* Remove the bags at the end of the hour and place the tubers on racks to dry. Treat at least 10 days before sowing, and before tubers are sprouted. The tubers may be immersed in the hot formalin solution in the bags, and after removing from the solution can be left in the bags for one hour. They must then be *immediately turned out to dry or considerable damage may result to the tubers. If the directions are carefully followed, no damage to the tubers will result.* Formalin may be used in metal containers without any danger of corrosion taking place. A supply of the stock solution, both hot and cold, should be at hand in order to more readily keep the correct temperature in the dipping tank. A carefully regulated fire may be used beneath the tank to keep the temperature around 120° F.

B.—*Cold Mercuric Chloride Dip*—

This is more effective than the formalin dip, but it is also somewhat more dangerous to use. In addition, it has the disadvantage that it rapidly corrodes metal containers (unless they are painted or lined with pitch, tar or asphalt-roof paint), and it can only, therefore, be used, as a general rule, in wooden, glass or earthenware vessels. Mercuric chloride is deadly poisonous to human, animal or plant life. In addition it is colourless, odourless and comparatively tasteless, and may easily be mistaken for pure water. It should, therefore, be used with great care and kept out of the reach of children or farm stock. When finished with, the solution should be poured into a hole in the ground, and the hole be immediately filled in or covered over. In case of mercuric chloride poisoning give whites and yolks of eggs mixed with milk. In emergency, ordinary flour paste may be used. Send immediately for medical assistance.

The solution for seed treatment is made up by using four (4) ounces of corrosive sublimate (mercuric chloride) in thirty (30) gallons of water. The seed tubers are soaked in this solution for an hour and a half. The solution is used to treat three batches of potatoes, and is then discarded

and a new lot of solution made up. The temperature during treatment should be not less than 45° F nor more than 70° F. If the temperature of the water is more than 70° F., the time of treatment must be reduced.

The tubers must be dried thoroughly after treatment by being thinly spread out on racks, etc., or the action of the poison will continue and damage to the seed will result. The crystals or powder may be easily dissolved in a little hot water, enough cold water being then added to make the thirty gallons.

Convenient vessels for treating the seed are wooden barrels or vats with wooden bungs at the bottom to drain out the liquid after the third lot of tubers has been treated. Cement or unprotected metal containers must not be used.

Keeping up the strength of the Solution.—Some growers prefer to add a little more corrosive sublimate after treating every second bag, rather than make up a new solution after every third bag. This is not recommended as a general rule, but if the grower desires to use this method, it has been the practice to advise the addition of three-eighths of an ounce of sublimate to each thirty gallons after treating every second bag. This scheme cannot be regarded as satisfactory, as the solution may easily become too weak to be effective, or so strong that injury to the tubers results. For these reasons a simple chemical test devised by Cross for determining the exact amount of corrosive sublimate to add from time to time is given at the end of this article, and is very strongly recommended. The cost of the materials required is low, and the method is interesting and simple. Any grower operating on a big scale should certainly adopt this accurate method as a big improvement over the uncertain hit-or-miss procedure of the past. The method has been tested out in this laboratory, and gives good results.

C.—*Hot Corrosive Sublimate*—

This is the most recent and apparently also the most successful method of treatment of tubers as a preventative against *Rhizoctonia*. The treatment necessitates a wooden tank being used. The strength of the solution is the same as in the cold dip, *i.e.*, four (4) ounces of sublimate to thirty (30) gallons of water, but the solution is heated to 126° F. by injecting steam through a rubber hose from a small boiler or heating plant. The potatoes are dipped for *two minutes* in wooden crates, and are then spread out thinly to drain and dry. The tank used must have a water capacity considerably in excess of the volume of the tubers to be treated at any one time, so that the temperature can more easily be kept uniform. All metal parts of the crates, etc., must be coated with asphalt-paint, tar or pitch to prevent corrosion.

It is not anticipated that many growers will be in a position to adopt this treatment at present, but the method is indicated so that progressive large-scale farmers may take advantage of this information if they so desire, and consider that the saving in time, etc., is worth the expense of the treatment. If adopted, the strength of the solution must be kept up from time to time as indicated above, or better still according to the method given below.

The "Cross" Method of determining the correct amount of Corrosive Sublimate to add to the tanks to keep the correct strength.

Have a chemist make up a solution in the following way:—Dissolve 5 grammes of potassium iodide in 1,000ccs. of water. To this solution then add one gramme of copper sulphate previously dissolved in a little water.

To use the solution take 10 ccs. in a 50 cc. measuring-cylinder. From a small lipped vessel such as a glass beaker or small china jug, slowly add to this the prepared corrosive sublimate solution, drop by drop, until an orange-red precipitate is formed. If both the chemist's solution and the disinfectant are of the correct strength, it should take 20 ccs. of the disinfectant to produce the orange-red deposit. Write down the actual amount required before dipping the first lot of potatoes, and then wash out the measuring-cylinder with clean water. After using the sublimate solution for dipping one or two lots of tubers make another test in the same way as before, after first bringing the solution in the tank up to the original level. The dipping solution will now be somewhat weakened, and consequently it will take more of the corrosive sublimate to produce the precipitate now than it did before.

Let us assume that exactly 20 ccs. of corrosive sublimate were required the first time. The second time, for sake of argument, 22 ccs. might be required. The disinfectant must now, therefore, be only 20/22 = 10/11ths. as strong as it was before the tubers were dipped. It is obvious, therefore, that it has lost 1/11th of its strength, and to bring up the strength to the correct amount, 1/11th. of 4 ounces = 4/11th. of an ounce = approximately 1/3rd of an ounce of corrosive sublimate must be added to every thirty gallons of the disinfectant solution. The sublimate solution must be tested in this way after every second bag, and the calculated amount of corrosive sublimate crystals added before dipping any more bags. The method is much simpler in practice than it appears in print.

2.—COMMON SCAB.

(Caused by *Actinomyces Scabies* (Thax.), Güssow.)

This disease is found not only on the potato, but has also been recorded by various observers on beetroot, turnips, mangels, rutabagas, parsnips, radishes and carrots amongst others. On potato, the disease is fairly common in Western Australia in certain districts, and especially so where the tubers are grown on soil which has been rendered somewhat alkaline by liming, or by the burning-off of the native vegetation.

Symptoms.—In typical cases this disease can be readily distinguished from eelworm-scab, which is the only other disease present in this State with which it could possible be confused. The disease is characterised by the presence of roughened and fissured corky areas on the surface, which contrast strongly with the smooth, lighter-coloured, unaffected neighbouring tissue (see Fig. 3). When isolated the diseased areas are generally approximately cylindrical, and they usually show a small series of more or less concentric corky ridges and corresponding fissures. The margins of the lesions are generally ridged up above the level of the surrounding healthy skin (see Fig 4). Only a single lesion may occur on a tuber, but more commonly there are several, and occasionally there may be so many that it is difficult to find an area of unaffected skin. The lesions are said to commence as small

brown specks at the breathing pores or lenticels. From these positions they gradually work outwards, and in the course of time may coalesce and form areas of very great extent (see Fig 5). In bad cases the whole surface of the tuber may be covered with lesions. Secondary organisms frequently then take control and may soon reduce the tuber to a disintegrating rotten mass.

Cause.—As stated above this disease is due to *Actinomyces scabies*. The organism is peculiar in that the genus to which it belongs consists of bacteria which form long thread-like multi-cellular filaments, which strongly

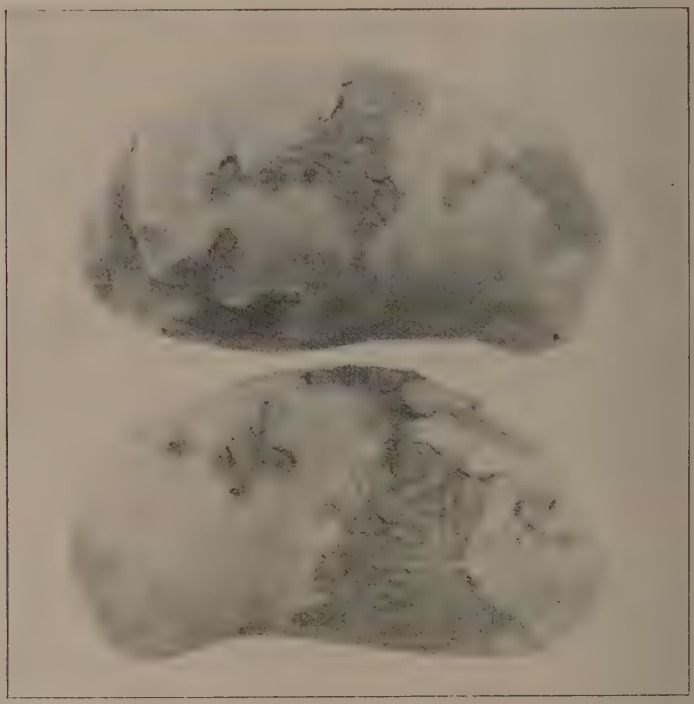

Fig. 3.—(Potato Diseases in W.A.) Common Scab due to *Actinomyces scabies*.

(Photo. by Author.)

suggest the *hyphae* or threads of the higher fungi. These threads very readily break up, however, into normal, unicellular, rod-like bacteria. These are able to live on the organic matter in the soil as well as on the surface of the potato tubers and the underground parts of certain other plants.

General Considerations.—*Actinomyces scabies* is greatly stimulated by the addition to the soil of lime, wood ashes, or any material which will tend to render the soil alkaline. It is for this reason that potatoes following cabbages or other crucifers, which have been heavily limed for the control of Clubroot (*Plasmodiophora brassicae*), are often badly affected with

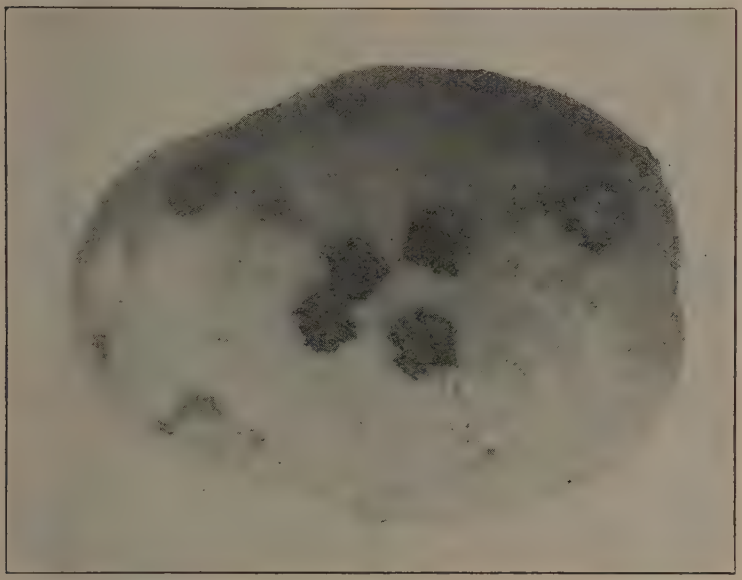

Fig. 4.—(Potato Diseases in W.A.) Common Scab due to *Actinomyces scabies.*

(Photo. by Author.)

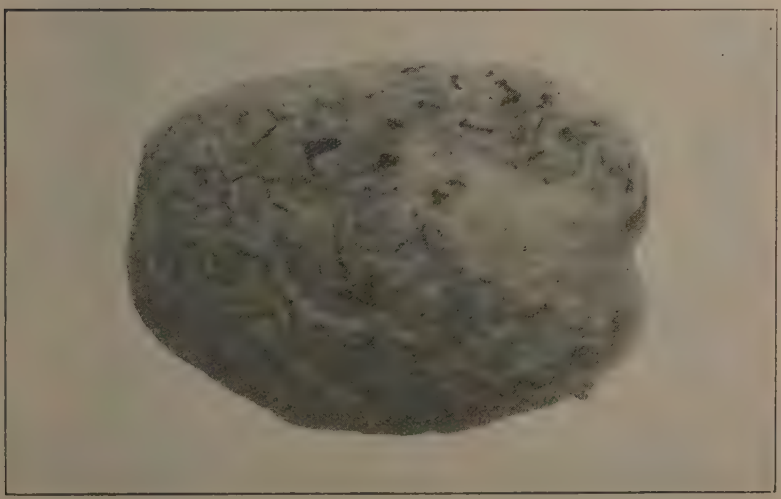

Fig. 5.—(Potato Diseases in W.A.) Common Scab due to *Actinomyces scabies.*

(Photo. by Author.)

Common Scab. Acidity is unfavourable to its development, and therefore, the use of acid fertilisers such as superphosphate, sulphate of potash and sulphate of ammonia will tend to reduce the disease. As nitrate of soda, if used for a considerable period, tends to render the soil reaction alkaline, it should not be used where Common Scab is likely to be in evidence. It is unfortunate that alkalinity is favourable to Common Scab, because by increasing the soil acidity to reduce attack by *Actinomyces*, the effect is to encourage *Rhizoctonia*. It has been shown, however, that attacks by both *Actinomyces* and *Rhizoctonia* are reduced by increasing the organic matter of the soil. The grower therefore should make every effort to increase the humus content of the soil by the incorporation of green manures, etc., if his soil is at all deficient in organic matter.

Common Scab is most serious where the soil temperatures are high. It has been shown that it does most damage—other things being favourable to it—at a soil temperature of about 72° F. Low moisture content appears to favour the disease, so that scab will be most serious under a combination of soil alkalinity, high soil temperature and low soil moisture.

Control—

1. If the soil is badly infested with *Actinomyces* rotate with other crops.

2. Use clean seed. Government-certified seed is the cleanest and best procurable.

3. No matter what the source of origin, treat all the seed tubers with formalin or mercuric chloride (corrosive sublimate) as recommended for *Rhizoctonia* control.

4. Substances tending to cause soil alkalinity such as lime or wood ashes should not be applied to the soil imediately before growing a potato crop. If they must be used they should be applied to other crops preceding the potato crop by as long a period as possible.

5. Every attempt should be made on soils at all deficient in organic matter to increase the humus content by the ploughing-in of green manure crops.

6. Avoid using nitrate of soda as it tends to increase the soil alkalinity. Use sulphate of ammonia or blood and bone instead.

As indicating the effect of acidity in reducing the amount of Common Scab, it is interesting to note that in certain parts of America where potatoes are very often grown for many years without a change of crop, the harrowing-in of from 300 to 450 pounds of inoculated sulphur before the potatoes are planted has given very good control. This treatment has not been tried out in Western Australia, and no recommendation can be made concerning it.

References.

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(Further potato diseases will be dealt with in subsequent issues of the "Journal.")

PIGS AND PIG-RAISING.

P. G. Hampshire,
Superintendent of Dairying.

The importance of the development of pig-raising as one of the primary industries of Western Australia cannot be too greatly stressed.

In Western Australia we have a deficiency in production of bacon and hams equal to nearly £200,000 per annum. When this exceedingly profitable market has been satisfied, export markets are geographically very favourable to Western Australian pig raisers as compared to the rest of Australia. Great Britain alone imports 420,000 tons of pork, bacon, etc., worth £32,000,000 per annum.

Western Australia has built large modern bacon factories capable of greatly increased output. We have also stud-breeders who have built up studs of high class pigs. The climate is good. Western Australia is a large grain producer, and has now embarked upon dairying on a big scale in connection with group and estate subdivision settlement. Dairying and pig-raising go hand in hand—the pig should represent at least 25 per cent. of the income of a dairy farmer. At least one brood sow should be kept for every three to five cows on a dairy farm.

Pig-raising combines with most branches of agriculture. No farm is complete without the pig. The pig converts waste or unsaleable farm products into excellent human food. The pig is a money-making farm scavenger. There is no need that the piggery should be a place to avoid—a place of offensive odours. People do not often realise that the pig is really a naturally clean animal. A dirty pigsty means a careless owner.

Pigs multiply more rapidly than any other farm animal. The annual increase of cattle is estimated at 80 per cent. to 90 per cent., sheep 95 per cent. to 115 per cent., and pigs 1,500 per cent. to 1,800 per cent.

Pigs produce more edible flesh from a given quantity of food than other animals. It requires 13lbs. of dry matter in the form of food to secure 1lb. of flesh in cattle, 8lbs. to 9lbs. with sheep to produce 1lb. mutton, and 4lbs. to 5lbs. to produce 1lb. of pork.

Pigs when slaughtered dress by far the greatest proportion of edible flesh, compared with cattle and sheep. Sheep dress 55 to 60 per cent., cattle 60 to 65 per cent., and pigs 78 to 80 per cent.

Pigs can be reared and fattened on a smaller area than any other farm animal. The capital outlay in pig-raising is very small in comparison to the income.

BREEDS OF PIGS.

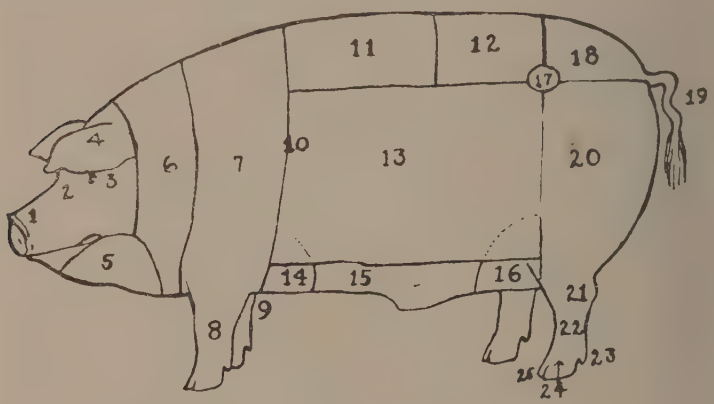
History tells us that swine (*sus scofa*) have existed in a wild state on the continents of Europe, Asia, and Africa since the earliest known period, and with some variation they have been found wild on the continent of America, but were unknown in the early history of Australia. It is generally accepted that the present-day domestic pig is descended from the wild species.

England, which is looked upon as a stud farm of the world, has furnished the majority of the improved breeds of pigs to-day, the origin of the breeds being the old English hog with crosses of foreign wild pigs.

The domesticated pig will revert to the wild state if permitted, but the process is slow, and they do not acquire the solitary habit nor become so fierce as the origin of the species.

The principal breeds of pigs to-day (of English origin) are Berkshire, Yorkshire (Large, Middle, and Small), Tamworth, and Large Black, (of American origin) we have the Poland-China, Duroc-Jersey, and Chester Whites. These vary in colour, and would be classified as follows:—Black: Berkshire, Large Black, Poland-China. White: Yorkshire (Large, Middle, and Small), Chester. Red: Tamworth, Duroc-Jersey.

The main points of difference are size of carcase and bone, size and shape of head, length and thickness of neck, length and depth of body and legs, colour of skin and hair.



Parts of the Pig.

1. Snout or nose.
2. Face.
3. Eye.
4. Ear.
5. Jowl.
6. Neck.
7. Shoulder.
8. Fore leg.
9. Chest.
10. Heart girth.
11. Back.
12. Loin.
13. Side.
14. Fore flank.
15. Belly.
16. Rear flank.
17. Hip.
18. Rump.
19. Tail.
20. Ham.
21. Hock.
22. Hind leg.
23. Dew claws.
24. Pasterns.
25. Toes.

PRINCIPAL BREEDS DESCRIBED.

Berkshire.

One of the oldest of improved breeds, origin Berkshire, England. Principal improvement in Leicestershire and Staffordshire. The original animal was large, similar to Tamworth, coarse of body, and the colour varied. Marked improvement developed early in 18th century, and was principally effected by Richard Astley and Lord Barrington. Berkshire's were first given a separate class at Royal Agricultural Show, England, in 1862. Early writers show that Chinese pigs were crossed with the Berkshire in their im-

provement. The improved Berkshire was greatly used on native swine in Ireland and Scotland, with beneficial results. This breed is most widely distributed and popular throughout the world, and does well in all climates.

Characteristics—

Size (relative).—Medium: larger than Poland-China, smaller than Large Yorkshire, Tamworth, and Large Black.

Adaptability.—In general adaptability they may be classed at head of all breeds for pork and bacon.

Maturing qualities.—Most excellent. Will fatten at any age.

Grazing and feeding qualities.—Splendid; strong digestive powers enable them to give a maximum return in flesh for food consumed.

A Berkshire Boar.

Quality of meat.—Excellent pork and bacon. Well mixed fat and lean. Dresses well in proportion to live weight.

Value for crossing or "grading-up."—Unexcelled. Most used in this respect. Great value to refine coarse breeds. Quick growers; early maturers.

Breeding qualities.—Medium to good, but vary according to conditions. If not too confined produce fair to good litters, and are fair mothers. Boars are particularly noted for prepotency, and readily impress the young pigs with conformity and early maturing quality.

Principal points—

Head.—Medium, broad, fleshy, good width between eyes, well dished, snout short.

Ears.—Fairly fine, sprightly, cocked, inclined forward, fringed fine silky hair.

Jowl.—Full, firm, symmetrical.

Neck.—Short, broad, muscular.

Shoulders.—Sloping, freedom from coarseness, thick through chest.

Back.—Broad, long, straight or slightly arched.

Barrel.—Ribs well sprung, deep, well let down even side and bottom line deep flank; loins strong.

Rump.—Wide, lengthy, square, showing strength.

Hams.—Deep and thick, well let down, joining back with hock.

Legs and feet.—Short, straight, strong, set well apart. Hoofs erect, firm and strong.

Skin.—Smooth, pliable, freedom from wrinkles.

Colour.—Black, with white blaze on face. White feet and white brush of tail.

A Berkshire Sow.

Objections—

Snout.—Long.
Ears.—Flopping, coarse.
Chest.—Narrow.
Shoulders.—Coarse, heavy on top.
Back.—Drooping.
Sides.—Flat, not well let down.
Loin.—Narrow or weak looking.
Rump.—Drooping.
Hams.—Narrow, short.
Legs.—Crooked, weak, close together, round bone.
Feet.—Weak, flat.
Hair.—Coarse, curly, bushy fringe on neck.
Action.—Sluggish, clumsy.

Disqualifications—

Colour.—White, irregularly placed. Reddish hair or spots.

(*To be continued.*)

SEAWEED AS A FERTILISER.

L. J. H. Teakle (Plant Nutrition Officer) and L. J. Newman (Entomologist).

On account of the danger of introducing Buffalo Fly (*Lyperosia exigua*) in the manure and litter from the cattle boats from the North-West, the landing of this material was prohibited in 1927. This action caused considerable hardship to the growers in certain districts, where they were relying on supplies from the boats to maintain the humus of their soils. As a result of a public meeting to consider the matter, the Minister for Agriculture, Hon. H. Millington, promised the assistance of Departmental Officers to determine the fertilising value of the seaweeds which accumulate along the beaches, to be used as a substitue for Stable Manure. Local reports indicated that seaweed was unsuitable as it would not decompose when applied to the soil. These investigations are the outcome of that promise.

The Use of Seaweed in Other Countries.—A review of the literature showed that seaweed is used successfully in many parts of the world in the immediate vicinity of the coast. The water content of the material collected on the beaches is very high, three quarters of the weight of the seaweed being water. This means that the handling and cartage is expensive—too expensive to allow of haulage for more than a few miles. Records show that seaweed washed with fresh water was used as a manure by the early Romans. Seaweed is still used extensively in the Channel Islands, and on the coastal soils of Great Britain, Ireland and France. It is of great importance along the New England coast in North America, and is used to some extent in Canada, Norway and the Eastern States of Australia. In these localities it is valued on account of its freedom from weed seeds and plant diseases and also on account of the fact that it decomposes much more readily than stable manure. In some districts it is valued at as much as £2 per ton. As a manure it is used very largely on early potatoes. To a lesser extent dressings are used for corn, mangolds and other roots, vegetables etc.

Applications range from 10 tons to 50 tons per acre of the moist material, averaging 25 tons to 30 tons per acre for early potatoes. It is usually supplemented by superphosphate or guano. It may be applied directly to the soil, or composted in pits or heaps covered with soil to rot before being used. When ready it is dug or ploughed into the soil. *Its main value lies in its power to increase the moisture holding power of light, sandy soils.* In addition it is valuable in that it materially increases the power of retaining such manures as ammonia and potash applied to these soils. It is relatively poor in nitrogen and very poor in phosphate. Potash is relatively abundant. Analyses indicate that seaweeds collected in early Spring are of superior fertilising value.

A botanical examination shows that seaweed in the Northern Hemisphere consists chiefly of true Algæ, Fucus predominating. Irish Moss (Chondrus crispus) is most highly valued as a source of manure in New England. Laminaria spp. or ribbon weeds are kelps of less manurial value.

The "Seaweeds" in Western Australia."—Before commencing experiments in Perth the seaweeds were examined botanically by Miss Reed of the University and chemically by the Government Analyst. It was found

that the material consisted of two Sea Grasses (Posidonia Australis and Cymodocera Antarctica), true seaweeds being entirely absent. Chemically the seagrass was very high in ash, which consistutes 50 to 60 per cent. of the dry matter. It was low in the fertilising ingredients, nitrogen, phosphate and potassium. The bulk of the ash consisted of calcium carbonate (limestone). The actual analyses reported by the Government Analyst are given in Table I.

TABLE 1.

Composition of seagrass obtained from the beach south of Fremantle, August 1928. (Results expressed as per cent. on a moisture free basis).

	Sample 1 per cent.	Sample 2 per cent.
Total Ash	51	62
Total Nitrogen (N)	0.56	0.44
Total Phosphorus (P)	0.066	0.063
Total Potassium (K)	0.31	0.10
Calcium Carbonate ($CaCO_3$)	35	47

Note.—Sample 2 had been washed with tap water to remove salt. This accounts for the loss of potassium.

One ton of Western Australian seagrass at 75 per cent. moisture compared with Cow manure at 77 per cent. moisture will supply:—

	Seagrass	Cow manure
Organic Matter	250 lbs.	500 lbs.
Nitrogen (N)	3.1 lbs.	11.2 lbs.
Phosphorus (P)	0.37 lbs.	3.4 lbs.
Postassium (K)	1.8 lbs.	13.4 lbs.
Calcium Carbonate ($CaCO_3$)	224 lbs.	nil

This seagrass is of low value as a source of fertiliser. Will seagrass rot under favourable conditions?

In order to determine whether seagrass will rot when placed under favourable conditions, three tons of the material were secured from the beach South of Fremantle. It was decided to test:—

1. The effect of washing out the soluble sea salts.
2. The effect of treating the original and washed material with:—
   (a) Stable Manure, 10 per cent.
   (b) Garden Sand, 10 per cent
   (c) Adco, 1.5 per cent.
   (d) Stable manure, 10 per cent., plus Adco 1.5 per cent.
   (e) Garden sand, 10 per cent., plus Adco, 1.5 per cent.

in comparison with samples moistened with water only.

Experiments were carried out in pits, to be on a practical scale, and in pots, for ease of handling.

The pits were dug in a section of Government Gardens to a depth of three feet and then filled with approximately half a ton of the moist sea grass intimately mixed with the various additions as required. A covering of sand was applied and the pits kept moist by frequent waterings.

For the pot experiment two series of 10 inch flower pots were used. In one series the seagrass, as it came from the beach, was used; in the other, seagrass, which had been leached for one hour with tap water.

Each series was treated as in the pit experiment, the seagrass being mixed with weighted amounts of stable manure, garden sand and Adco, and combinations of these additions. As in the pit experiment 10 per cent. (by weight) of Stable manure and garden sand and 1.5 per cent. of Adco were used The pots were filled with 2 kilograms of the moistened material, well pressed in. The seagrass was found to be quite bulky, and did not yield to pressure. The pots were covered with bags which were kept moist throughout the experiment.

From time to time the samples in the pits and in the pots were examined. It was observed that the samples in the pots were maintained at a better moisture content and that the volume of material diminished considerably. At the end of the experiment, after being "rotted" for seven months the volume had shrunk to less than half of the original. In addition the fibre had become brittle and somewhat slimy—in fact the moist material closely resembled well rotted stable manure. In the pits the decomposition was slower owing to the difficulty of maintaining the moisture in the pervious soil. The shrinkage in volume was much less indicating that *the first requirement for satisfactory rotting is an abundance of moisture.*

The pit samples were prepared on August 23rd. 1928, and final samples taken March 20th, 1929, seven months later. The pot experiment was started on September 1st, 1928, and finalised on March 20th, 1929, after a period of nearly 7 months.

The samples were examined for Ash content, moisture content and availability of the organic matter. The results are summarised in Table 2.

TABLE 2.

Composition of seagrass before and after "rotting" treatments.

Treatment.	Moisture per cent. (moist basis).	Ash per cent. dry matter	Organic matter per cent. dry matter.	Proportion organic matter humified per cent.
	%	%	%	%
Original Sample Stored dry...	7·7	52·3	47·7	67
Washed Sample Stored dry...	5·3	58·4	41·6	57
Pit Samples (Average) ...	35·5	65·6	34·4	64
Pot Samples (Average) ...	66·4	68·7	31 3	61

These results show that the organic matter of seagrass is in a readily humified condition as determined by the method devised by Robinson (Journal Agr. Sci. 15: 26-29, 1925) even before the artificial "rotting" process was started. The effect of the rotting led to a considerable loss of organic matter but this was necessary to bring about the proper physical condition of the material. Study of the individual samples showed that the effect of the Adco, stable manure and garden sand were negligible as far as any difference in rate of rotting was concerned.

Recommendations.—As a result of a study of the literature supplemented by the enquiries here reported certain recommendations may be made.

1. The moisture holding capacity of the seagrass is sufficient to warrant its use as a substitute for stable manure where transport does not render the cost prohibitive.

2. On account of the loose nature of the product as it comes from the beach, it is advisable to compost it for a period of about 6 months. During this period *the material must be kept in a saturated condition.*

3. As the fertilising constituents are very low it will be well to treat the seagrass with superphosphate when composting it. From twenty to fifty pounds of superphosphate per ton may be used.

4. As this manure is designed *to increase the water holding capacity of light sandy soils* and not to supply fertilising ingredients it is necessary to add the usual dressings of artificials to the crops.

5. A mixture consisting of half stable manure and half seagrass composted for several months would be superior to the seagrass used alone.

6. Where seagrass it to be used systematically, it should be gathered from the beaches in late winter or early spring and composted. *It must be kept moist in the compost* until late autumn or early winter, when it should be applied to the soil and then *dug or ploughed in.*

7. As this manure is low in organic matter, relatively heavy dressings must be given. At least ten tons per acre should be used. It should be completely buried in the soil.

8. On account of the high content of calcium carbonate, this seagrass will be valuable on lime deficient soils. It will be at least as good as a dressing of agricultural lime.

In preparing this paper, free use has been made of the following literature:—

The Farmers' Handbook; New South Wales Leaflet No. 254, Board of Agriculture and Fisheries; H. J. Wheeler, Manures and Fertilisers; J. Alan Murray, Soils and Manures.

THE MANURING OF POTATO CROPS.

W. E. COLLINS,
Potato Inspector.

No other crop receives so much artificial fertiliser, or responds so well to it as the potato, which of all our agricultural plants is the most efficient convertor of artificial fertilisers into human food. In order that plants may develop and mature normally, ten essential food elements are necessary. If any one of these ten is absolutely lacking, no plant growth is possible. Fortunately the ordinary grower need not remember all ten, because experience has shown that the majority of these food ingredients are abundantly present in the average potato-growing soil. Of all the elements in the soil necessary for plant growth in this State, usually only three are not present in sufficient quantities for the production of large crops. These three are nitrogen, phosphorus and potash.

It is not the intention of the writer to go into the intricate physical, chemical and biological problems of plant nutrition, but to explain in as terse and simple language as possible how fertilisers may be used effectively and economically in the production of the potato.

A rational system of fertilising should be well grasped by every grower. Just as butter in the human diet cannot fulfil the same functions as meat,

so a plant food ingredient like nitrogen cannot possible be used by the plant for the same purposes as, say, phosphate or potash. Each plant food ingredient has an effect and duty of its own to perform in the development of the plant, and one plant food cannot do the work of another.

Cultural experiments and practical experience in the field have shown that the following are the specific effects or functions of the three main plant foods mentioned above.

NITROGEN.

The function of nitrogen is to promote the vegetative growth of the plant, and of giving the foliage a healthy green colour. It will be found that plenty of nitrogen, with sufficient moisture, makes the plant grow luxuriantly, giving it a big body, so to speak. The effect of deficiency is seen in a general stunting of the plants, and by the somewhat yellowish-green colour of the leaves. An excess produces a marked increase in the development of the foliage which is of a darker green than usual. Maturity is considerably delayed by the excessive use of nitrogen. Soils are more often deficient in nitrogen than in the other two elements, as it is constantly being removed from the soil in drainage water. Nitrogenous manures are, therefore, most important for the potato, and have the most immediate and direct effect. Experience has shown that under average conditions they are more likely to increase the yield of potatoes than either potash or phosphates. The commonest form of nitrogenous fertiliser used by the growers in this State is sulphate of ammonia. It is very soluble in water, but differs from the nitrate of soda, in that it is well absorbed by the soil constituents, and is not so readily leached out by rains. If a fair amount of rain is expected during the growing season, it is wise to apply only half the amount of ammonia in the furrow at planting time, reserving the other half for a top dressing, spreading this on as soon as the plants are discernable in the rows.

PHOSPHATES.

Two important functions are attributed to phosphates, viz., the stimulation of root development and the hastening of maturity.

Until quite recently the belief was current that the potato crops should receive a very generous application of phosphates, and trials conducted by the Potato Branch rather indicated this, but experiments conducted at other potato-growing centres have demonstrated that heavy phosphatic manuring may be responsible for only very small increases in yield. This may be due to the early maturity induced by phosphates and may counteract, to some extent, the beneficial effects of these manures.

The need for extra phosphates is not so general or so pronounced as that for nitrogen and potash, and in many districts, particularly the South-West, where the later element is almost a negligible quantity, much might be done in the use of a more balanced fertiliser.

For the potato crop superphosphate is generally accepted as being the most suitable phosphatic fertiliser, as it is readily available to the plant, and can be mixed with most other manures.

POTASH.

Potash is an important fertiliser for plants which produce an abundance of carbohydrates, such as starch and sugar, consequently the potato crop is dependent on a good supply of this element.

Experiments have proved that potash influences to a marked degree the health and growth of the tops. The most serious potato disease—Irish Blight—is favoured by heavy doses of nitrogenous manures, while potash tends to reduce its severity, and plants are said to be more resistant to fungoid and insect attacks when well fed with potash. Potatoes require a properly balanced relation between the nitrogen and potash to produce a healthy growth.

Although for most growers bulk of crop is of first consequence, due consideration should also be given to qualtiy. The ultimate criterion of quality is a cooking test, and there seems to be no doubt that the application of this element improves the cooking quality, whilst the absence of potash tends to give a sodden ill-flavoured potato.

Its effect on the crop is not very noticeable in the field, but a lack or abundance of potash is clearly shown by the weight and quality at the time of digging.

In general, potash goes to the making of better keeping, better eating and better seed potatoes. Various forms of potash manures are on the market, the principal one for use with the potato crop being sulphate of potash.

How are these fertilisers taken in by the plants? It may be explained here that the above compounds are termed "salts" by the chemist, and the three plant-food elements mentioned must, therefore, be present as salts to be available to plants. They are the actual fertilising ingredients in all fertilisers and manures.

It is a matter of common knowledge that plants cannot "swallow" solid particles of fertiliser, but that such particles must first of all be dissolved in water before the plants can make use of them. Normally, therefore, the soil moisture brings into solution the plant-food substances in the soil, and the plant roots then absorb or suck in this food-containing solution. A fertiliser becomes available to the plant only when it is soluble in the soil moisture. The soil moisture is never pure water, but always contains among other things carbonic acid, which weak acid increases the dissolving power of water. It is clear, too, from the above, that fertilisers can act as food in the soil only when the necessary moisture is present. Hence the great importance in this State in the summer with its customary long spells of dry weather to practise diligently the various moisture-saving devices.

Regarding what constitutes a profitable mixture to use, and the weight to be applied per acre, this critical point can only be determined by actual field experiments. The problem presented by each soil varies, and the grower must modify the quantities of fertilisers to suit his requirements. Manuring is subordinate to soil and climate: if these are unfavourable no skill in manuring will ensure a profitable yield. Further, manuring will not rectify the results of bad cultivation.

As a basis, the following mixture is likely to give satisfactory results:—

6 parts superphosphate.
3 parts sulphate of ammonia.
3 parts sulphate of potash.

Apply at the rate of 12 to 15 cwts. per acre, not forgetting, as mentioned previously, if a fair amount of rain is expected during the growing season to apply only half of the ammonia at time of planting, reserving the balance as a top-dressing.

BEEKEEPING NOTES.

H. Willoughby Lance,
Apiculturist.

Last winter quite a number of colonies were lost through starvation. The spring was late, changeable and wet. With a normal spring many colonies would just have pulled through. But with the bad spring weather they consumed the last particle of food and quietly died out.

In the majority of cases with proper beekeeping this would not have occurred. Many beekeepers, in their greed for returns, rob the bees of their winter store instead of taking the surplus and leaving plenty of stores to cover emergencies.

The past season has varied very much in different districts. In Jarrah and Tuart and, in some cases, Marri districts, it has been exceptionally good, but in many places the reverse has been the case. When examining hives in March and April last I found very many with little or no honey therein, and at once warned the beekeeper to feed his colonies or he would not have any by the springtime.

There may be beekeepers who read these notes, who did not carefully examine their hives at the close of the summer and ascertain that they had plenty of winter stores. Any such I would advise to at once go through their hives, lifting each one to ascertain the weight, and if any are light, mark these, and then on the first warm, sunny day open them carefully, disturbing the bees as little as possible. Examine the outside combs and see how much honey there is. The amount required varies with the district. In most cases a fairly strong colony should have enough honey to fill at least two full-depth combs. A really strong colony three or four. It has to be remembered that bees consume a large amount of honey when brood-rearing. Very often a few warm spring days will start brood-rearing, then a spell of inclement weather sets in and the bees use up their last reserve of stores to feed the young larvae, and cannot get any more to replace it. Also much of the young brood gets chilled and dies. Then when honey weather sets in again there is delay in breeding until there is a fresh store in the larder both of honey and pollen.

If there is little or no honey, the bees should be fed at once with honey syrup or, failing this, sugar syrup. With an average thick honey, about two-parts of honey to one of water is a good proportion. See that all the honey is dissolved and mixed with water. Give this to the bees warm. There are many good feeders on the market, particulars of which can be obtained from any catalogue of bee goods. Failing one of these, a good home made feeder is shown in Figure 1. The box is about 6in. x 4in. x 3½in. deep, a division is placed one inch from the end, the bottom only extends to this, thus having an entrance from the bottom, one inch wide. The top of the box consists of a piece of glass which slides in from the end, a space about ¼in. must be left between the top of the wood division and the glass. A piece of thin wood is now cut about ⅛in. smaller, each way, than the inside of the box, and a number of small holes bored therein. The box is filled with syrup, and a piece of wood acts as a float from which the bees feed, coming up through the inch space, extending over the division on to the float.

The advantages of this feeder is that it can be seen when it is empty, and can be refilled without removing from the hive. The inside may be filled with hot wax, swilled round and emptied out. This will make joints honey tight. If the matter is urgent and the beekeeper has not time to make the above, an effective feeder can be made by punching small holes in the top of a press top tin, which after filling is inverted on to a plate and placed

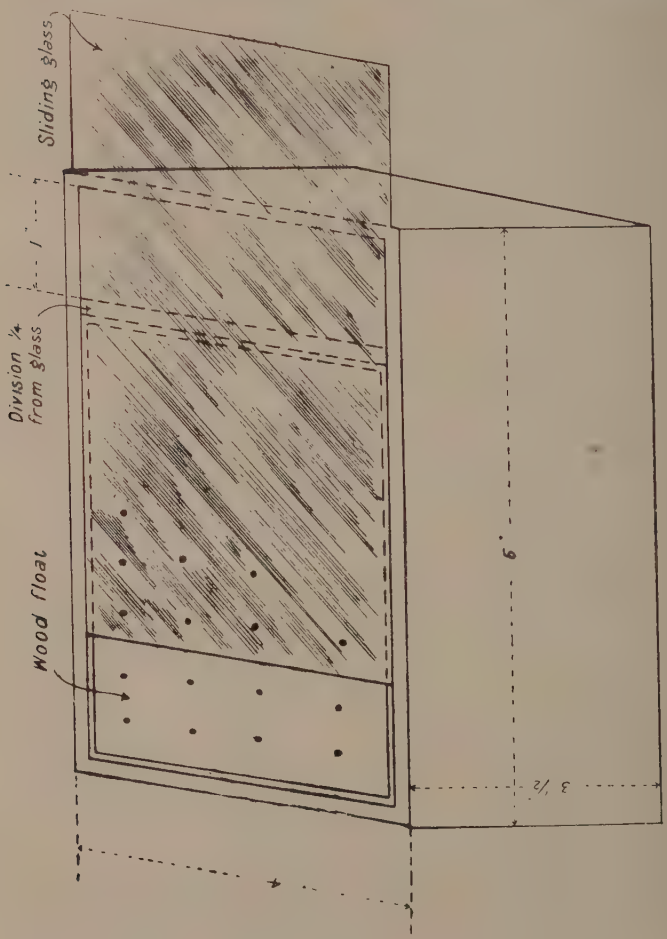


FIG. 1

on top of the frames inside a spare super box or a quilt made from some strong material can be put over the frames, a hole cut in the centre, and the inverted tin placed over the hole. This method has the advantage that during cold weather the brood nest is kept warmer than with the plate method. If any colonies are weak, only covering a few frames, entrances should be closed to two or three inches.

As soon as the spring really sets in all hives should be examined, as it is a most important time for beekeepers. Hives should be cleaned and faulty

ones replaced. (Now is the time to prepare hives for this spring examination. See notes in the *Journal* for June, 1928.) The brood nest should be examined, and if the queen is old and failing, the hive should be marked for re-queening at the earliest possible date. The amount of honey stores should be noted and, if necessary, colonies should be fed. If a colony is short of pollen, make a note of it, and later a hive may be found that can spare a comb of this most important food for the young bee, as no breeding can take place without it.

The first object of all beekeepers should be to build up strong colonies. The aim should be two 10-frame body boxes boiling over with young bees. I still find that the aim of many beekeepers is to make a show with a large number of hives, perhaps thinking that means a lot of honey No greater mistake can be made. A lot of hives frequently means no honey. Whereas a few strong hives means plenty of honey and less work. This is realised to such an extent in the United States of America and England that many beekeepers are using 12-frame hives with deeper frames. At the present stage of beekeeping here, I do not recommend this, except in special cases, with experienced beekeepers, but advise every beekeeper to aim at two full-depth bodies packed with bees. A good well-bred queen can easily keep these filled with brood during an average season. Cull your queens, and if you have any duds replace them with good stock. Who would be content with a hen that laid one egg per week when he can have one that will lay six or seven. Yet that is what many beekeepers have in the way of queens, those that lay only four or five hundred eggs per day instead of one or two thousand.

Re-Queening.—I am often asked how to re-queen, so I will give a few notes here on the matter. Of course, the first thing to do is to catch and kill the old queen, otherwise the young one will undoubtedly be killed. The usual process is to lift out the combs one by one and examine until the queen is found. It is handy to have a spare body near the hive so that the frames, as they are examined, may be replaced therein; otherwise while one comb is being examined the queen may pass from an unexamined comb to one that has been examined and replaced, and thus she will be missed. If all combs have been examined and the queen not found, carefully examine the floor board and sides of the hive, then re-examine the combs as they are replaced. If she cannot be found another method may be adopted. Remove the hive some 10 yards away in front of and with the entrance facing the old bee stand. Place an empty hive on old position.

Now place a white sheet or piece of newspaper in front of the old hive and an entrance guard over the entrance, open the hive, take out two combs of brood and examine for queen. If not found, shake half the bees on to the sheet, examine again, and if no queen place these two combs in new hive and fill up the space with empty combs on sheets of foundation. All flying bees will now return to the new queenless hive. Examine bees on sheet, and if queen is not found, take remaining combs and shake remaining bees off on to the sheet, examining bees after each shaking for the queen, then replace combs in old hive. If queen has not been found, close up the hive and leave until next day. In the meantime large numbers of bees will have sought their old stand and entered the new hive. As the number of bees in the old hive will now have been much reduced, it should not now be difficult to find the queen. This having been done, all the old combs and

bees may be transferred to the new hive; or the old hive can be replaced on its old stand and the two combs and bees in new hives transferred to it.

The queen having been disposed of, the usual method is to leave the hive queenless for a day, then taking the mailing cage in which the queen has been received, remove the cork or corks and also remove one frame from the centre of hive and wedge the cage between the remaining frames. In the course of a few days the bees in the cage and those outside will have eaten away the candy and the queen bee released. By this time she will have the scent of the hive, and will be accepted.

Other methods of introduction are:—

1. Smearing the queen with honey and placing her directly between the frames.
2. Wetting the queen with water and placing directly between the frames.

Both these methods depend upon the instinct of the bees to clean up the honey or water; by the time this is completed the queen and bees will have the same scent, and the queen will be accepted. Mr. Bartly of Tasmania claims that he has been successful with the water method in 98 per cent. of the introductions. His method is to wet the queen by placing her in a short glass tube partly filled with tepid water, shake the tube to and fro, pour off the water and allow the queen to walk down amongst the bees after giving a puff of smoke.

Yet another method which I had recommended to me, and which I have used with complete success, is the paper bag method. Take a small thin paper bag, such as is used for lollies, place the queen to be introduced therein, without any of her attendant bees, then catch 10 or a dozen bees from the hive and place them in the bag with her. Although the queen is strange to them, they will be so busy trying to get out that they will not take any notice of her, and in the meantime they will all get the same scent. Remove one frame and place the bag in the hive between the frames, and in the course of a few hours the queen will have been released and accepted. The advantage of this method is that there is no need to leave the hive queenless for a day. I have opened a hive, destroyed the queen, and introduced a new one in a paper bag straight away with considerable success.

Whatever method is adopted, the hive should not be disturbed for about three days, after which time it should be opened to see that the queen is "O.K."

Pollen.—As has already been mentioned, apart from honey, the future generation of the hive depends upon a supply of pollen. Pollen is the reproductive substance of flowers, which is transferred from the male to the female portion of the flower or from the male flower to the female flower for the reproduction of species. Nature has provided various methods for this transfer. Amongst these are flying insects, of which bees are the principal. Pollen is the vital substance of the flower in concentrated form, is highly nitrogenous, and contains necessary vitamins. Nature is always prolific, and provides more than is necessary for reproduction purposes. Bees as they visit flower after flower carry the pollen and fertilise the stamens. In doing this they take a toll for their service, and carry some of the surplus pollen away to their hives to make food for their young larvae. When breeding is taking place the nurse bees consume honey and pollen and convert this into chyle food, which is deposited in the larvae cells.

If there is a shortage of pollen, therefore, breeding suffers, and the colonies do not build up, or may dwindle if insufficient bees are not bred to make up for wastage. The importance, therefore, of a pollen substitute has been realised by beekeepers for many years. From experiments that have been made it is evident that the question must be studied scientifically. Recently the Beekeepers' Association of Victoria approached the Commonwealth Committee of Scientific Research with a request that investigation should be made to find a pollen substitute, but the request was turned down.

The question is being studied in other places, and the following particulars of experiments at the College of Agriculture and Forestry, Brno, Czechoslovakia, will be of interest to beekeepers. As far back as 1871 Fischer propounded the theory that the pharyngeal gland was the source of the larval food. Stephen Soudek at the above College has recently been making microscopical studies of this gland, and his experiments therewith confirm Fischer's conception.

He fed very young bees, which had just emerged from the cells, with different foods and compared their action on the pharyngeal gland. He found that these glands only developed with those bees whose food had contained pollen. In cases where the food only contained honey or sugar, these glands shrunk up, proving the real importance of pollen. After this he tried many substitutes, amongst which were wheat flour, wheat bran, starch, ground beans, olive seed cake, linseed cake, peanuts cake, ground fish, ground meat, etc. All of these did not bring the pharyngeal gland to development. Only in two cases did the glands become fully turgescent. These were when the young bees were fed with fresh egg albumen stirred into sugar syrup or with dried yeast. He, therefore, assumes that these substances can replace pollen, but states that many further experiments will have to be made before any pronouncement can be made.

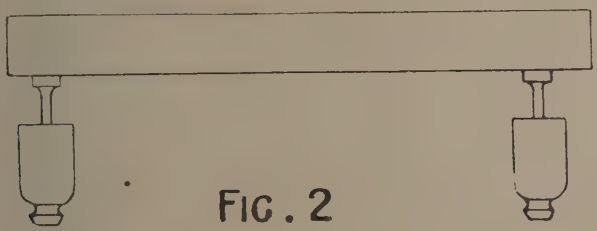


FIG. 2

He, however, advises beekeepers that as we know of no definite pollen substitute they should, when there is a lack of pollen, feed the bees with the fresh white of an egg stirred into sugar syrup. Pine pollen collected the previous season did not provoke any development of the gland. Bees feed on the yoke of an egg, ground meat and ground fish died in a few days. It is surprising the variety of substances bees will carry in to their hive when there is a shortage of pollen. They realise the need for some such substance, and in their extremity have been known to work on wheat shorts fed to cows, fine sawdust, and even coal dust.

Old pollen that has been stored in the comb for a long time seems to loose its goodness, and bees always prefer the fresh gathered substance.

If there is old hard pollen in the hive, and yet no breeding taking place at the usual time, I would recomend the removal of this pollen by scraping down the comb with a sharp tool almost to the midrib, then pound the pollen—if particles of comb are mixed with it, it will not matter—and stir in with the fresh white of an egg mixed with sugar syrup.

If any method of feeding pollen, or pollen substitute is adopted, care must be taken to feed slowly and to keep up the supply until natural pollen comes in.

Ants and Stands.—In some districts ants are a great pest, not only attacking bees that alight on the ground, but climbing the hive and entering therein. The small sugar ants frequently making their nests between the quilt (where these are used) and the cover. That is one reason why I do not recommend the use of quilts. It is far better to have a bee space of ¼in. between the tops of frames and the cover.

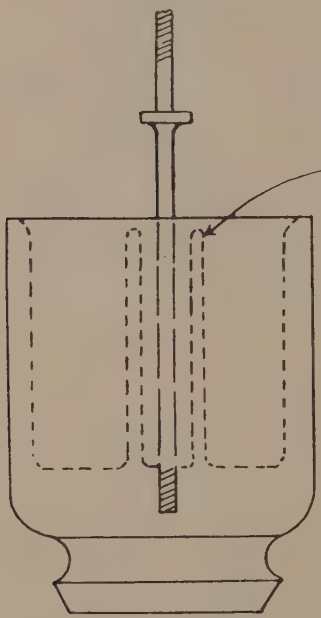


FIG. 3

The larger types of ants, particularly the Meat Ant (*Iridomyrmex detectus*) attack the hives and cause large numbers of bees to stay home to defend the entrance.

If nests can be located, bi-sulphide of carbon, sheep dip, or cyanogas are good substances for destroying same. A hole, several inches deep, according to size of nest should be made in the centre, and a quantity of one of the above substances put therein, and the hole covered up. If the nests cannot be located or are too numerous, a good ant-proof stand may

be made from old telegraph insulators, as shown in Figure 2. Four pieces of 3 x 2 inches may be nailed together to make an oblong the size of hive, and four inverted insulators let in to the corners. These should be of the hollow type, and the inside collar of china broken away (see Figure 3). This space will now form a cup, which is filled with kerosene.

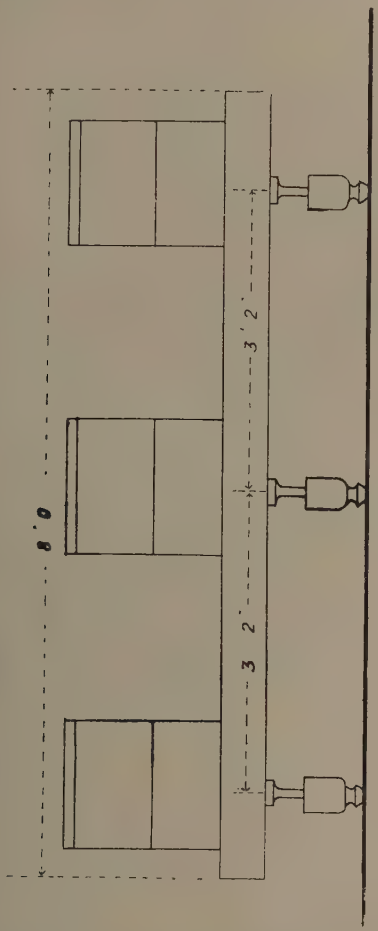


FIG. 4

If there are a large number of hives, stands to carry three hives are very convenient, and only six insulators need be used instead of 12. If the stand is made eight feet long, this will allow spaces between the hives for placing supers, etc., when manipulating. The insulator legs should be placed directly under the hives, and as these are frequently screwed on to the metal shanks, they can be screwed up or down to adjust the stand to a level. (See Figure 4.)

SUBTERRANEAN CLOVER SEED AND ITS IMPURITIES, WITH A COMPARISON BETWEEN MACHINE CLEANED SEED AND SEED IN THE BURR.

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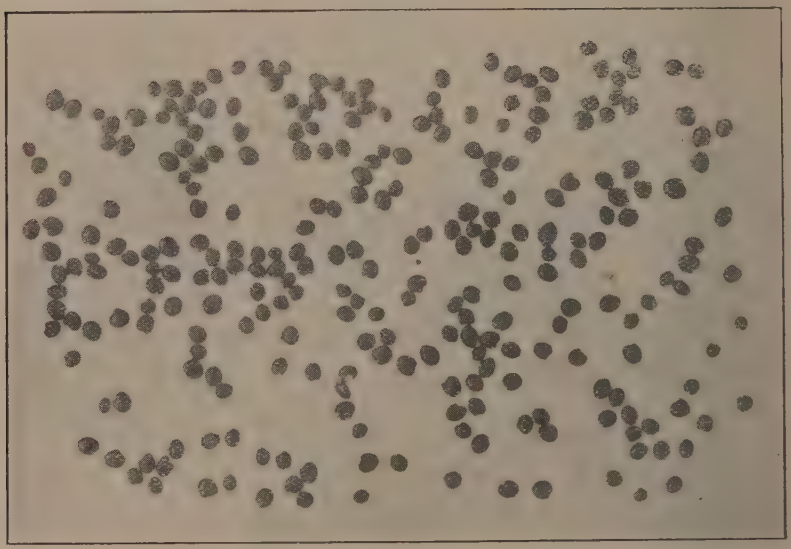
Assistant Plant Pathologist.

Subterranean Clover is the principal leguminous pasture plant of the South-Western portion of this State. It is the most important factor in the development and maintenance of that agricultural area, and consequently special attention should be given to the buying and using of good seed. This need was never more pronounced than it is at the present time.



No. 1.—A clean well-graded sample, with a purity of 98 per cent. and no weed seeds. Compare this with No. 2.

When buying the seed the farmer should take into consideration the following points:—

1. Quality.
2. Purity.
3. Germination.

1. *Quality.*—Subterranean Clover seed of good quality is large, about one-eighth of an inch in width, dark purplish to nearly black in colour, dull or slightly shining, averaging 114,800 seeds per lb., and is practically free from weed seeds and other impurities.

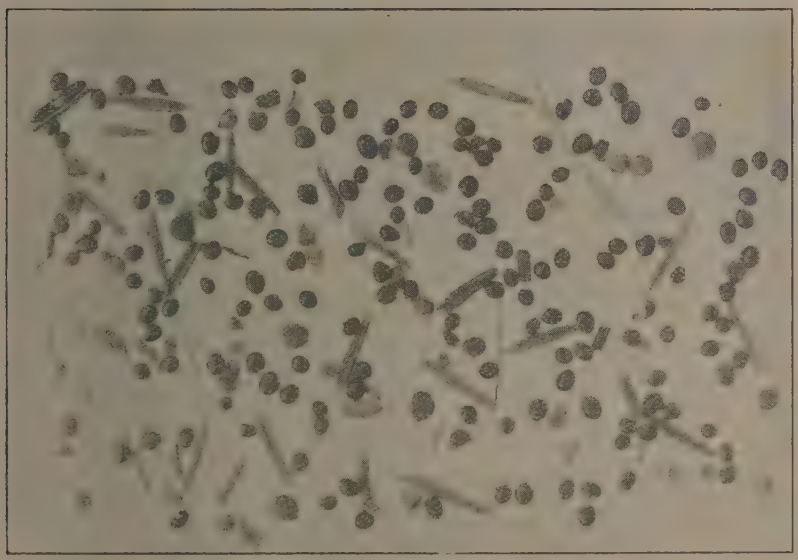
Among samples will be found some that are practically free from weed seeds and dirt, germinating 85-93 per cent. (see Fig. 1), and others which

contain dirt and weed seeds, including species that are not desirable. (See Fig. 2).

These extremes can be represented by the analyses of two samples, which were actually submitted for test.

Sample No.	Price per 10lbs. at 2s. per lb.	Percentage of Weed Seeds.	Percentage of Dirt, Sticks, Stones, etc.	Percentage of Sub. Clover Seed.	Percentage of Sub. Clover Seed that germinated.	No. of Weeds per lb.	Relative Value per 10lbs. of germinable Sub. Clover Seed.
							£ s. d.
1	£1	Trace	0·6	99·4	92·5	90	1 0 0
2	£1	17·8	14·0	68·2	70·0	9,888	0 10 11

In order to sow an equal amount of good germinable seed from each sample, it would be necessary to sow 9 lbs. of sample No. 2 to give the same result as 5 lbs. of sample No. 1. Every time 450 weed seeds are sown with No. 1, 88,992 weed seeds would be sown with the other sample.



No. 2.—A dirty, weed-infested sample, seeds of uneven size. Purity 78 per cent., weed seeds 16 per cent. This sample was sold for the same price as No. 1.

From the above figures a farmer can see what a difference in real value as compared with quoted prices, the quality of the seed makes.

2. *Purity.*—The test for purity consists in determining the percentage by weight of the sample which is true to name; the percentage of inert matter, such as broken or insect-damaged seeds, earthy matter and impurities of vegetable or animal origin, and the percentage of foreign seeds, *i.e.*, weed and other seeds, are incidentally determined.

Freedom from Weeds.—The farmer, when planting his Subterranean Clover, does not want to sow with it large quantities of foreign seeds (some of which may be bad weeds, such as dodder, thistles, docks and sorrel), but requires as near as possible seed which is free from weeds.

The occurrence of weed seeds in samples is due to the weedy condition of the Subterranean Clover fields, these weed seeds being harvested with the burr. These seeds will appear in the cleaned Subterranean Clover seed in quantities proportional to their abundance in the field, and inversely proportional to the extent to which the clover seed is cleaned. Thus a long list of foreign seeds is liable to appear in commercial samples. A first-class sample of seed should contain none or only a few weed seeds.

List of Foreign Seeds which have been found in Subterranean Clover Seed and Burr.

Legumes—*Medicago denticulata*—Burr Medic.
Medicago lupulina—Black Medic.
Trifolium cernuum—Drooping Flowered Clover.
Trifolium glomeratum—Cluster Clover.
Trifolium procumbens—Hop Clover.
Trifolium tomentosum—Woolly Clover.

Grasses—*Alopecurus pratense*—Foxtail.
Avena sativa—Oats.
Bromus maximus—Large Brome.
Bromus mollis—Soft Brome.
Bromus sterilis—Sterile Brome.
Cynodon dactylon—Couch Grass.
Festuca Myuros—Silvery Grass.
Hordeum murinum—Barley Grass.
Hordeum sativum—Barley.
Lolium perenne—Rye Grass.
Lolium temulentum—Drake.
Paspalum dilatatum—Paspalum.
Setaria spp.—Millets.
Sorghum sudanense—Sudan Grass.
Stipa spp.—Native Spear or Corkscrew Grasses.

Other Weeds.—*Bartsia viscosa*—Yellow Weed.
Brassica spp.—Mustards.
Cuscuta spp.—Dodder.
Cryptostemma calendulaceum—Cape Weed.
Erodium spp.—Crowfoot.
Hypochaeris glabra—Catsear.
Hypochaeris radicata—Flatweed.
Inula graveolens—Stinkwort.
Plantago lanceolata—Rib Grass.
Plantago major—Large Plantain.
Romulea rosea—Guildford Grass.

Other Weeds (*contd.*)—*Rumex acetosella*—Sorrel.
Rumex spp.—Docks.
Sonchus oleracea—Milk Thistle.
Tunica prolifera—Wild Pink.
Native Rush Seeds.

Of this list the most serious are:—
Bartsia viscosa—Yellow Weed.
Cuscuta spp.—Dodder.
Inula graveolens—Stinkwort.
Romulea rosea—Guildford Grass.
Rumex spp.—Docks and Sorrel.
Stipa spp.—Spear or Corkscrew Grasses.

In sheep country *Bromus, Stipa* and *Medicago denticulata,* particularly, should be avoided since their seeds are detrimental in wool.

Any Subterranean Clover seed samples containing dodder should not be used or bought, for dodder is a parasitic plant, which lives at the expense of the growing clover, and will quickly ruin the pasture. The seed of dodder is more easily introduced by sowing the burr, for well milled and graded Subterranean Clover seed should always be free from it.

3. *Germination.*—The germination test is not less important than the test for purity, for the farmer should avoid buying seed of low vitality, a condition which can only be determined by the germination test. Some samples of Subterranean Clover give a high germination, others give only a low one, while others are intermediate.

As it is possible to obtain high grade seed, a farmer should not be willing to take the risk of buying seed the germinating quality of which he does not know, nor be satisfied with only a fair-grade seed. Partial failure of fields is often due to the reason that much of the seed planted does not germinate.

The test consists of determining, by number, the percentage of germinable seed, of "hard seeds," and of dead seeds.

Hard Seeds.—In testing Subterranean Clover seeds, indeed all clover seeds, for germination, there is always found a percentage of "hard" seeds which do not germinate in the usual time. These seeds do not for the time being absorb water, and consequently do not germinate. In Subterranean Clover the percentage of hard seeds varies. In, for instance, machine-cleaned seed, the hard seeds vary from 2-70 per cent., whereas with burr the percentage is much higher, ranging from 54-92 per cent.

Under field conditions hard seeds remain dormant, but they may, after a time, germinate; if they germinated the first year they would, in all probability, only result in weak plants, being shaded and overcrowded by their earlier, more vigorous neighbours.

Hard seeds have some advantages, and are useful at times in the burr. When early rains germinate the germinable seeds, and dry conditions following kill off the young seedlings, the farmer has the hard seeds to rely on, as they are not affected by the early rains, and a percentage of them will germinate later on, promoting a fair stand.

Another advantage of hard seeds is that, when the conditions in established pastures were unfavourable for the plants to reach maturity (only a small number of seeds maturing, and not re seeding the fields sufficiently), in the following year a percentage of hard seeds may germinate, thus assisting in producing a fair stand of clover.

Hard seeds keep their vitality for a number of years, but when the seed coat becomes sufficiently permeable for water to penetrate they will germinate.

It is rather difficult to determine the value of "hard seeds," but there are two courses open to follow:—

1. To regard the hard seeds as useless, merely noting their presence.
2. To assume a portion of them, say one-third, will germinate in a reasonable time.

Authorities differ as to which is the better of the two ways, but it would probably be safer to leave them out of the calculation altogether.

Results of purity and germination tests on burr and machine-cleaned Subterranean Clover seed from the year 1923 are given in the following tables:

TABLE 1.—SUBTERRANEAN CLOVER BURR.

Year.	No. of Samples.	Purity.	Germination.	Hard Seeds.	Weed Seeds.
		%	%	%	%
1923–4 Average ...	5	14·6	22·9	74·6	0·4
Range ...	...	6·0—19·3	16·0—38·5	57·5—84·0	Trace—2·0
1924–5 Average ...	7	9·9	10·7	81·8	0·9
Range ...	...	1·6—24·3	3·0—19·5	72·0—91·3	Trace—3·5
1925–6 Average ...	7	13·5	44·7	54·7	0·3
Range ...	...	9·9—23·4	43·5—46·0	54·0—55·5	0·03—0·5
1923–6 Average ...	19	12·6	27·5	70·9	0·54
Range ...	...	1·6—24·3	3·0—46·0	54·0—91·3	Trace—3·5

NOTE.—Since 1926 the number of samples of Burr tested are not sufficient to warrant giving any definite averages.

TABLE 2.—SUBTERRANEAN CLOVER—CLEANED SEEDS.

Year.	No. of Samples.	Purity.	Germination.	Hard Seeds.	Weed Seeds.
		%	%	%	%
1923–4 Average ...	3	93·8	78·1	19·3	Trace
Range ...	...	93·0—96·0	69·0—86·5	11·7—28·0	0—Trace
1924–5 Average ...	4	96·8	62·6	27·3	0·25
Range ...	...	94·3—99·5	37·5—79·5	14·0—61·5	0 0·7
1925–6 Average ...	8	95·5	75·03	23·1	Trace
Range ...	...	84·0—99·4	45·0—89·0	11·0—52·5	0—Trace
1926–7 Average ...	12	93·5	59·0	39·2	0·25
Range ...	...	82·8—98·0	30·5—80·0	14·5—69·5	0—1·2
1927–8 Average ...	11	92·6	71·9	24·3	0·85
Range ...	...	88·5—98·2	47·0—91·0	2·0—53·0	0—3·0
1928–9 Average ...	22	90·2	62·1	33·6	1·63
Range ...	...	68·0—99·0	32·0—92·5	4·5—51·5	0—17·8
1923–9 Average ...	60	92·6	66·17	30·3	0·82
Range ...	...	68·0—99·5	30·5—92·5	2·0—69·5	0—17·8

The above tables show that machine-cleaned seed is the best, the purity and germination being higher, and the percentage of weeds and hard seeds lower.

Taking the cost of these two in 1923, burr was sold on the average at 10s. per bag of about 35-40 lbs. weight, whereas the machine-cleaned seed was sold at 6s. 6d. per lb. From one of each of the best samples examined in that season, the burr gave 12.5 per cent. purity and 22 per cent. germination, whereas the cleaned seed gave 95 per cent. purity and 78 per cent. germination. A bag of burr weighing 40 lbs. and giving 12.5 per cent. purity would result in 5 lbs. of pure seed, and 20 lbs. of machine-cleaned seed of 95 per cent. purity would give 19 lbs. pure seed.

The cost of 1 lb. of the burr seed would be 2s. and that of the cleaned seed 6s. 10d., but the burr seed gave 22 per cent. germination and the cleaned seed 78 per cent. germination, so that the final actual cost of the respective samples per lb. of pure cleaned germinable seed was 9s. 1d. in the case of the burr, and 8s. 9d. with the machine-cleaned seed.

From these figures it will be seen that the cleaned seed at 6s. 6d. per lb. was more economical than burr at 10s. per bag. This is neglecting the cost of transport, which adds to the cost of the burr.

In 1923 the farmer did not have much choice, as there were only limited supplies of the cleaned seed available. This cleaned seed had to be imported from the Eastern States where there were machines capable of cleaning the seed. Owing to these difficulties the main areas were sown with Subterranean Clover burr.

This is not the position at the present time, as there are many machines operating in this State, and now cleaned seed can be obtained for about 2s. 3d. per lb., but there are still people who will buy the burr which is sold at about 6s. 6d. per bag.

It is much more economical and beneficial to sow the cleaned seed, for in every case the cleaned seed will give a higher percentage of purity and germination, and a lower percentage of hard seeds and weed seeds.

Generally speaking the farmer does not find it very difficult to obtain his Subterranean Clover seed, but since 1923 a large number of commercial samples have been examined, comprising some that were good, others bad, and still others worthless. Some contained weed seed impurities in much greater proportions than should have been the case.

Profitable growing of Subterranean Clover depends largely on the use of good seed and the non-introduction of undesirable plants.

In conclusion, good Subterranean Clover seed should have a reasonable proportion of mature seed of at least average size, with only a small proportion of impurities, a minimum amount of weed seeds and a good capacity for germination with a minimum percentage of hard and dead seeds.

Some of the principal causes of Subterranean Clover seed being poor are want of proper cleaning, careless handling, and the harvesting of the seed from dirty, weed-infested pastures.

The following points require special attention when buying seeds:—

1. Buy from reliable seedsmen, and, if possible, on tested samples, or obtain samples and have them tested. Firms will give a percentage statement as to purity, germination and weed seeds.

2. Avoid buying cheap seeds. Always demand the best.

HORTICULTURAL NOTES.

GEO. W. WICKENS,
Superintendent of Horticulture.

SEASONABLE WORK FOR JULY, AUGUST, AND SEPTEMBER, 1929.

July.

July is usually one of the months of the year in the fruitgrowers' calendar when outdoor work is carried on with considerable discomfort, because whether it comprises pruning, spraying, or planting, the rainfall generally renders the job an unpleasant one and visions of rheumatism incurred through remaining in wet clothes has a tendency to damp enthusiasm even in the younger generation of fruit producers. But at any rate so far as pruning is concerned unpleasant weather conditions must not delay the work or spring will arrive (and with it the duties pertaining to that period of the year) before the operations belonging to winter have been completed, and there is nothing so disorganising as the endeavour to catch up in a later time of the year with work which should have been completed earlier in the season.

There are many text-books dealing with pruning, and I shall not endeavour in these notes to cover a subject which, if fully dealt with, would fill a fair-sized volume, but I would remind growers that they can obtain advice and practical demonstrations from the orchard supervisors who traverse their districts, and the information contained in text books becomes much more easily understood after seeing the work performed. I know there are many growers who have been in the industry for a fair portion of a lifetime, and these, from experience gained by experiment and observation, have evolved a system of winter pruning suited to the requirements of their trees. Some of the systems follow orthodox procedure; some vary from it considerably, but a system which gives a maximum quantity of high quality fruit and assists the trees to maintain a sound physical condition is quite a good system, whether it be orthodox or otherwise. The growers referred to are not likely to alter their methods, but there are many newcomers now giving attention to fruitgrowing who have not even a rudimentary knowledge of the principles underlying the practice of pruning, and these are strongly advised to seek instruction either from the orchard supervisors or neighbours who have proved successful. Many years of wasted effort and expensive mistakes can be guarded against by starting out on right lines.

Neither spraying nor planting can be efficiently carried out during wet weather, the former because the spray mixture will not adhere to the trees, and the latter because wet, sticky soil is not in a fit condition to receive the trees. These two operations must then, of necessity, be postponed if weather conditions in July are unsuitable.

Fruit-fly traps in citrus orchards need attention at short intervals throughout July, particularly open traps which are liable to become flooded.

August.

Pruning should be completed by the end of August, and the same advice applies to planting deciduous trees. Citrus trees should not be planted until September unless in specially well-drained situations. Where old apple and pear trees require working over to other varieties, the necessary scions should be secured early in this month from trees of proved bearing habit, and buried in soil in a cool place to retard bud bursting.

Growers whose orchards are infested with San José Scale are reminded that they are obliged to spray at least once during winter months, and where the pest is prevalent are advised to spray twice. Instructions under the "Plant Diseases Act" have been issued to this effect and growers failing to comply render themselves liable to prosecution and a minimum fine of £5 with a maximum of £100. Fortunately, most orchardists are aware of the danger of allowing their orchards to remain unsprayed, and there is not often the need to invoke the power of the law to compel them to spray, but it certainly is significant during the last few years to note that growers whose fruit has been rejected from export on account of infestation with San José Scale have now considerably less scale than formerly, and it would appear that, though the spraying has been done annually, more care has been exercised in the application since losses have been experienced through rejections. Spray thoroughly with the right materials or the work done is merely a waste of time and money.

Orange aphis will appear this month and where the insects are sufficiently numerous to damage the young shoots they should be sprayed with Black Leaf 40 and soap, using 1lb. Black Leaf 40 and 3lbs. soap in 80 gallons of water.

Carefully examine loquats for traces of fruit-fly and destroy these, with any oranges and mandarins found to be infested.

Continue trapping for fruit-flies and examine, cleanse and replenish traps frequently.

September.

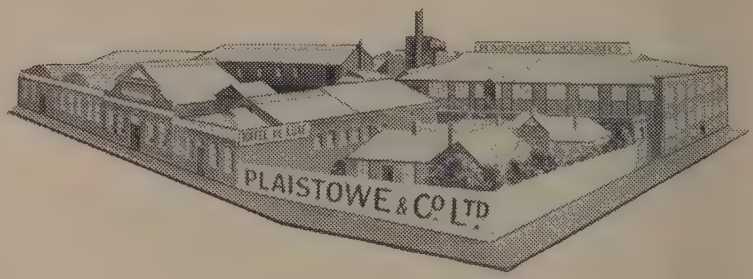
Ploughing, hoeing and cultivating are major operations during September.

Citrus tree planting must be finished this month. Graft over all obsolete varieties of apple and pear trees with varieties which will pay, but only graft such trees as have sound healthy stocks. An unthrifty stock will never produce a good tree. Use the strap graft and, if not familiar with it, ask the orchard supervisor in the district for a demonstration.

Continue treatment for Orange Aphis.

Trap and bait regularly for fruit-fly.

Pay special attention to Pear Scab. Attention to the soil, the trees, pests and diseases makes September a month of strenuous endeavour, but there is great joy in springtime in watching fruit form and grow as the result of duties faithfully performed.



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2—4

"POTATO CHIPS."

G. N. LOWE,
Senior Potato Inspector.

What one pair of hands can accomplish.

It is quite unusual for the writer in his travels amongst the potato producers to find a "one man" effort in the way of persuading the "wily" tuber to do its best, except on very small plots.

Just what can be done by sheer application to the job in hand, thoroughness, and perseverance is demonstrated most markedly this season by Mr. Fred H. Tonkin, of Young's Siding.

Mr. Fred Tonkin and 87 of his "little potatoes" which filled a bag. These will be on view at the next Royal Show in the exhibit of the Potato Branch.

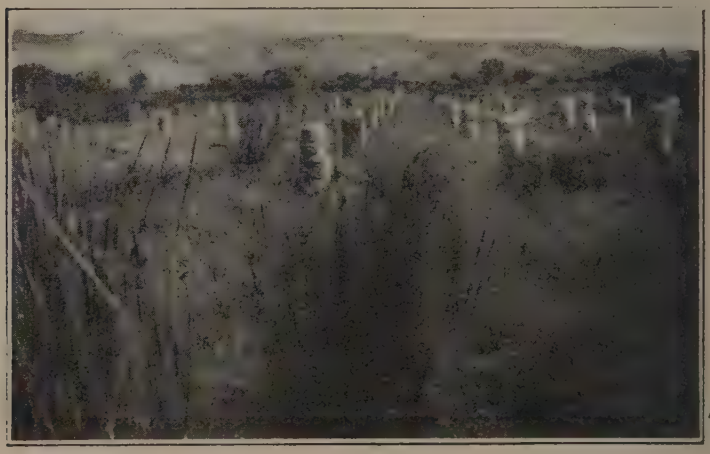
Mr. Tonkin, who is a son of the Secretary of the Certified Seed Potato Growers' Association of that centre, comes well within the "lightweight" division, but what he lacks in brawn he certainly makes up in "stickability" and energy.

Mr. Tonkin believes in thoroughness first and last, and the result from his single handed effort in working four acres of peat swamp, racking, grading, and dipping the necessary seed, carting and handling twice the manure, planting the area, harrowing, cultivating, and hand hoeing that area, and taking off something over 50 tons of potatoes is in itself something of which to be proud. The mere keeping down of weeds in this wonderfully fertile class of soil is no lazy man's job, and would induce a distinct feeling of shyness ("work shyness") in the average man.

Mr. Tonkin is moreover a thorough believer in "root selection" for the provision of his seed, and is one of the few growers in the State who are consistently practising this ideal method of maintaining and increasing their yield.

Portion of Mr. Fred. Tonkin's crop which yielded at the rate of 19 tons per acre.

As an indication of what is thought of this grower's certified seed, it is interesting to record that practically the whole of his yield was booked up weeks before the crop was dug. One well known South-Western grower actually ordered 15 tons before the crop was planted.



Nine tons of potatoes on ½ an acre grown by Mr. Fred. Tonkin.

The opportunity offering to careful Great Southern growers.

Now that the fact that certified seed from the Albany-Denmark area is fast retrieving what was becoming a very serious position from a standpoint of profitable potato production, more particularly in the South-West, it is becoming more and more apparent that certain of our best growers in the former area can devote the whole of their energies to growing certified seed. The only portion of their crop which need be marketed in the ordinary way is that which for some reason or other is not fit for certification, amounting perhaps to 10 per cent. and probably less, this being, of course, governed by the condition of the crop.

With an assured market in the South-West for seed for winter planting at an advance of from £4 to £5 per ton in every season, over 50 per cent. of which in a good crop is clear profit, the particular grower has an excellent opportunity.

On present indications, due to Mosaic ("Crinkly Leaf") appearing more or less badly in crops grown from certified seed from the Great Southern, after two plantings in the South-West, there will be a regular demand for the former seed each season.

When it is known that approximately 20,000 bags of seed are required for the South-Western winter crop under the present acreage sown, and that to date not more than 5,000 bags of certified seed have been available in any one season (with the demand greatly increasing), the prospect for the careful grower in the Albany district, who will concentrate on seed production, looks rosy indeed.

Reduction in Importations.

It is very satisfactory to be able to record the steady decline in the quantity of potatoes imported each year for a period, into this State.

The following figures taken at the end of March for the last three years will give a good indication of the saving which is occurring to the State and incidentally to the grower:—

Year.	Tons.	Value. £
1927 ..	335 ..	3,863
1928 ..	284 ..	1,725
1929 ..	96 ..	1,114

Whilst importations in any year to the end of March only represent a small portion of the year's total, the proportional reduction has been maintained. Undoubtedly the use and influence of certified seed is largely responsible for this pleasing state of affairs.

Sprouted v. Unsprouted Seed.

Not often does it occur that the relative merits of sprouted as against unsprouted seed can be so nicely compared as in the next illustration.

This photograph was taken on the property of Mr. J. C. Blake, at Young's Siding, and he explained that in order to finish off the "land" he found it necessary, owing to a shortage of sprouted seed, to use some of the same strain which was not nearly so forward.

The difference in germination is apparent, and from appearances at the time the yield would be five to six tons to the acre in favour of the sprouted seed.

Enquiries for Seed.

More often than not when letters reach this office from growers asking information as to where supplies of seed may be obtained the very important detail as to the proposed time of planting is not mentioned. This omission makes it very difficult for the best information to be given in reply. It will greatly assist if this be mentioned in each instance.

Sprouted v. Unsprouted Seed. Showing unsprouted seed results in the centre.

A probable cause of bad germination.

During this last summer crop numerous instances came under notice of bad germination with cut seed in portions of a planted area, other portions being normal.

The soil moisture upon investigation appeared, of course, to have a very definite influence, but it would seem that the application of the fertiliser direct on to the cut surface of the "set" is an important factor to be considered.

Where no care had been exercised in placing the "set" to see that the skin side was not exposed to the fertiliser the resultant damage was often so great as to practically wipe out the crop. Soil temperatures are probable another influence under summer conditions, but it does certainly appear that that little lack of extra care in planting is causing much loss.

A very simple test of what is likely to occur can be made by dusting a few freshly cut sets with fertiliser and allowing them to stand for even a few hours. The loss of sap begins almost at once, and eventually the set practically collapses. Under field conditions a modification of this occurs, the severity or otherwise doubtless being controlled by soil moisture.

It is proposed to shortly carry out an experiment in order to learn something definite in this direction both for winter and summer planting.

In the meantime it is wise to either press the set into the mould away from direct contact with the fertiliser or alternatively cover the seed with a very narrow sod and apply the fertiliser next it.

Record Yields.

When last year, at Young's Siding, returns of up to 21 tons per acre in portions of crops were obtained, it seemed as though the limit had been reached.

Mr. Kurt Martin stands to after digging portion of his crop which yielded at the rate of 23 tons 7cwt. per acre.

This season, however, the wonderful yield of 23 tons 7 cwt. per acre was harvested by Mr. Kurt Martin on a portion of his land. From two acres of the same class of soil Mr. Martin took 40 tons of excellent tubers which is probably nearing a world's record for two acres.

NUT GRASS

(*Cyperus rotundus*, Linn.).

C. A. GARDNER, Government Botanist.

Nut grass is a common weed in the South-West inhabiting damp situations. It is particularly common on low flat soil which is wet in winter, and along the shallow banks of creeks. Where undisturbed in a suitable environment it may become an aggressive weed, its habit of spreading by means of its underground rooting stems with tubers or "nuts," together with its capability of frequent seeding, making it very formidable.

Each tuber or nut is capable of producing a new plant, hence cultivation helps to spread the plant instead of destroying it. The plant appears, however, to spread itself more by seeding than by spreading in the soil. Nut grass is particularly tenacious. If covered up to three feet with soil it will re-appear and flourish. It has been known to penetrate through two inches of blue-metal asphalt which contained no visible fissure, and in New South Wales the roots were found 30 feet below the surface during well-sinking operations. The rhizomes are stated to perforate and completely riddle potato and dahlia tubers.

Nut grass is not a true grass, but belongs to the Sedge family. The "nuts" are tubers, and are said to yield an essential oil which is used by the natives of Upper India for perfuming clothes. They are rich in starch, and are eaten by our aborigines in some localities. The leaves of nut grass are bright green and rather harsh. The flower stalks are triangular and solid, and it may thus be distinguished from true grasses, together with the fact that the leaf sheaths are not split to the base as in true grasses.

Horses and cattle eat the leaves and pigs are said to be remarkably fond of the tubers, but pigs are not to be considered of much value as eradicating agents, since they do not eat out the patches completely, and probably serve to encourage the plant by stirring up the soil.

Three methods of eradication for nut grass may be recommended, depending upon the circumstances of its occurrence. Where the weed is not plentiful it may be exterminated by persistent hoeing, extending over long periods, or by forking the "nuts" out of the ground. Poison (Arsenite of Soda) may be used, but the applications require to be frequent. Poisoning should only be resorted to on waste lands or on pathways. Smothering the weed by covering it to a depth of at least 6 or 9 inches with manure and straw is the most efficacious method. The manure in fermenting destroys all plant life below it.

Choking the plant out by growing a crop of some vigorous plant such as Lotus or Clover may help to exterminate the weed, and this plan has the advantage of utilising the soil in the process.

It is of the utmost importance to prevent the plants from seeding, since by this method nut grass spreads far more than would be the case if limited to encroachment through the soil. Frequent summer cultivation would encourage the stirred up tubers to grow and this, repeated at intervals, would do much to destroy the plants.

The seeds of nut grass have a hard coat, and except perhaps with sheep, they are not destroyed by ingestion. Manure from horses and cattle that have fed on nut grass is likely to produce new plants.

Nut Grass (*Cyperus rotundus,* Linn.).

Description of the plant.—A perennial grass-like plant with a creeping rhizome swelling at intervals into nut-like tubers. Stems slender, 3-angled, especially towards the top, 8-18in. high. Leaves shorter than the stem, the

sheaths often long and loose. Flowers in little brown spikes called spikelets, usually 6 to 10 together in clusters, in an umbel of a few rays, the outer ones sometimes long and slender, but usually the umbel is rather dense. Spikelets linear, acute, flattened, usually about ½in. long with about 12-20 flowers, the rhachis slightly flexuose and bordered by transparent rather broad wings. Glumes imbricate, more or less distinctly several-nerved, with a usually green prominent keel. Stamens 3, style split into three branches. The nut or seed is obovoid, 3-angled, and less than half as long as the glume.

Cyperus is from the Greek *Kypeiros*, applied probably to the species described above, now used as a name for the genus; *rotundus*, which is Latin for "round" refers to the shape of the tubers of this species.

Nut grass is also known as "Java grass," but the name is not particularly applicable, since the species is indigenous in most temperate and tropical countries.

ROUGH CLOVER.

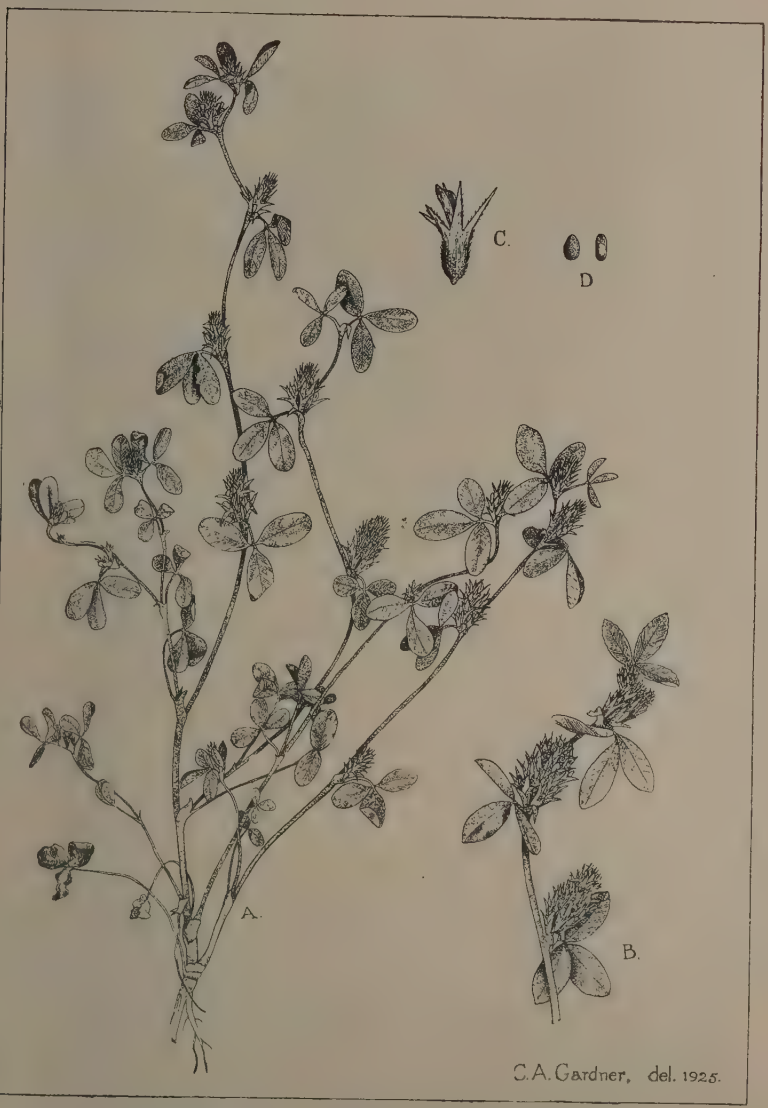
(*Trifolium scabrum*, Linn.)

C. A. GARDNER,
Government Botanist.

Rough Clover is one of the least known of our clovers, and at the present time is of little importance, because it is only known to occur in small patches in localities near Perth. Like many of our local clovers this plant has now established itself. The plant is one of the late flowering annual clovers, the flowering season synchronising with that of Cluster Clover. So much does it resemble the latter, that it might easily be mistaken for Cluster Clover, and hence its distribution may be more widespread than shown by the records of its occurrence. The plant is more prostrate than Cluster Clover, lying close to the ground with only the ends of the branches assuming an erect position. The stems are coarser, but are fairly succulent, and the whole plant is covered with small rough hairs. The flowering head is stalkless, as in Cluster Clover, but is oblong instead of being spherical. The plant is not very densely foliaged. Rough Clover is a species which appears to be more suited to dry conditions than Cluster Clover. This being so it will be possible to grow it in areas where only the medics have been grown, and although it will not yield any great bulk of seed, it should prove of value in dry pastures. The seeds of this clover are not obtainable locally, and the value of the plant for pasture purposes has yet to be demonstrated.

Description of Plant.—A spreading or procumbent or almost prostrate annual invested with small hairs, the stems somewhat rigid. Leaflets obovate to cuneate-obovate, minutely denticulate, the secondary nerves arching towards the margins. Flower heads ovoid to ovoid-oblong, contracted towards

the base, closely sessile to the axils of the leaves. Flowers white. Calyx leathery, hairy, the throat constricted by a callous ring composed of two lip-like calli; the calyx-lobes lanceolate, becoming rigid, and spreading and recurved after flowering, the lowest longer than the tube. Standard shorter than the calyx. Seeds ovoid, smooth, light yellow, slightly flattened, the radicle not prominent.



Rough Clover (*Trifolium scabrum*, Linn.).

PHOSPHATIC LICKS FOR STOCK.

A COMPARISON OF THE PALATABILITY OF BONE AND MINERAL PHOSPHATES.

GEO. L. SUTTON, Director of Agriculture,

R. P. ROBERTS, B.Sc. (Agric.), Agricultural Adviser.

Very striking evidence of the deficiency of phosphates in their pastures is afforded by the development of a depraved appetite in the stock grazing on them. This abnormal appetite under extreme conditions becomes very strongly marked in cattle, and to a lesser extent in sheep. The depraved appetite or "pica" manifests itself in many ways; the animals may show a desire for excessive amounts of salt or for chewing bones, and in the latter case it is technically known as "osteophagia." In extreme cases it takes the form of a craving for all sorts of rubbish and the animal will then chew leather, rags, etc., and show a desire to lick tins and stones, or as has been found in Western Australia, sheep will develop an appetite for decomposing or dried rabbit carcases. It is then known as "allotriophagia."

Because of the natural craving for bones and even carcase debris which stock develop when their diet is deficient in phosphorus, it is very natural to assume, as did the writers, that stock would take more readily to an organic phosphate like "Bonemeal" than to a "Mineral" Phosphate Lick. To ascertain to what extent this preference existed with regard to sheep, an experiment was carried out at the Chapman and Merredin Experiment Farms during the present autumn. The experiment was elaborated to determine also to what extent the addition of molasses would increase their preference for the mineral lick.

The experimental licks were prepared by the Cuming Smith and Mt. Lyell Farmers Fertilisers Ltd., and had the following composition:—

Lick 1.—Sterilised Bonemeal—4 parts.
Salt—2 parts.

Lick 2.—Finely ground rock phosphate—4 parts.
Salt—2 parts.

Lick 3.—Finely ground rock phosphate—4 parts.
Salt—2 parts.
Molasses—1 part.

A weighed quantity of each lick was placed in suitable containers near water troughs and on camping grounds in the paddocks where the sheep were grazed. At the end of each week the quantity of lick remaining in each container was weighed so as to ascertain the amount taken by the sheep and then the quantity of lick in the container made up to the original weight. The farm's flocks at Chapman, consisting of 297 ewes and 110 lambs, and 456 ewes and 156 lambs at Merredin, were then given access to the licks in the containers.

At both farms the experiment was continued for three weeks and was terminated after the first rains. At Chapman this period was from 26th March to 16th April, and at Merredin from 7th April to 28th April.

The results indicating the relative preference of the sheep for respectively a bone phosphate and mineral phosphate are given hereunder in Table 1, which shows the average weekly consumption per sheep, in ounces, of Licks Nos. 1 and 2.

TABLE 1.—AVERAGE AMOUNT CONSUMED PER SHEEP.

	CHAPMAN.		MERREDIN.	
	Lick 1. Bonemeal.	Lick 2. Mineral Phosphate.	Lick 1. Bone Phosphate.	Lick 2. Mineral Phosphate.
	ozs.	ozs.	ozs.	ozs.
First week	·11	·09	·05	·14
Second week	...	·02	·05	·17
Third week	·06	·08	·03	·27
Averages	·06	·06	·04	·19

From these results with the mixture of phosphate and salt only it will be seen that only small quantities were consumed, but contrary to expectations, the sheep did not show any preference for the organic phosphate as supplied by the sterilised bonemeal, but accepted the mineral phosphate just as readily at the Chapman farm and much more readily at Merredin.

The effect of adding molasses to the mineral lick is shown hereunder in Table 2.

TABLE 2.

	CHAPMAN.		MERREDIN.	
	Lick 2. Mineral Phosphate.	Lick 3. Mineral Phosphate and Molasses.	Lick 2. Mineral Phosphate.	Lick 3. Mineral Phosphate and Molasses.
	ozs.	ozs.	ozs.	ozs.
First week	·09	·37	·14	·34
Second week	·02	·41	·17	·29
Third week	·08	·41	·27	·55
Averages	·06	·40	·19	·39

These results show that the sheep have a preference for the mineral lick when molasses is added to it, and this was very much greater at Chapman than at Merredin.

For those who desire to mix their own licks and to add molasses to them, it may be stated that experience has shown that, to ensure ready mixing, it is advisable to mix with the molasses half its weight of water before adding it to the salt and phosphate. The addition of this water also affords those who wish to use an iodised lick a ready means of adding the potassium iodide. This latter, say, at the rate of 1½ozs. per cwt. of phosphate, should be dissolved in hot water, then the molasses added and the liquid evenly distributed through the phosphate and salt previously mixed together.

MURESK EGG-LAYING COMPETITION, 1928-29.

W. T. RICHARDSON,
Poultry Adviser.

The second Egg-laying Competition held at Muresk Agricultural College commenced on the 10th April, 1928, and concluded on the 17th March, or a total of 48 weeks.

Three sections were provided for, *i.e.*:—

Section "A."—Light breeds, represented by 138 White Leghorns.

Section "B."—Heavy breeds, comprising 132 Black Orpingtons and 6 Rhode Island Reds.

Section "C."—Ducks, consisting of 4 group pens of 6 ducks each.

In Sections "A" and "B" the birds were entered in groups of 6, and every pullet was single-pen tested.

Winners of Competition—Section "B," Black Orpingtons.
(Laid 1,066 1st grade eggs.)
Owner: Mr. J. W. Russell, Osborne Park.

On arrival 15 pullets were rejected on account of crooked breasts and four through being under the weight stipulated. They were all replaced by suitable birds.

One pen of six ducks infested with Stickfast Flea was rejected, and the entry cancelled.

The condition of the birds on arrival was generally good. Some competitors forwarded their pullets in crates unsuitable for birds intended for competition. Small, low crates in which they cannot stand to their full height without striking the top, or squat comfortably, do not tend to give the birds every chance in making a good start.

Mr. J. W. Russell's team of Black Orpingtons put up the highest score in the competition, with a total of 1,066 first-grade eggs, therefore, winning the first prize in that section and the champion certificate for the competition. None of the birds were laying when sent to Muresk, and three out of six did not lay an egg during the month of April. Considering that for the first three weeks of the competition this team showed the lowest scores in its respective section, it put up a most creditable performance by gradually overtaking all other teams and finishing ahead of them. The birds went through the test in fine condition, without showing signs of a moult.

The winner of the second prize in the heavy breeds, Mr. A. F. Lethbridge, led in that section from the commencement of the competition till the fourth week in January, when he was overtaken by the winning term. His scores were 1,012 first-grade eggs.

White Leghorns—Winning team in Section "A."
(Laid 928 1st grade eggs.)
Owner: Mr. R. A. Dusting, Osborne Park.

In the light breeds the team owned by Mr. R. A. Dusting secured first prize with 928 first-grade eggs to its credit. Two birds in this team moulted early, one of which was again in full feather, and commenced laying before the term of the test, a severe handicap on the total scores shown.

Pineapple Poultry Farm secured second place in this section with an aggregate of 830 first-grade eggs.

Hen No. 57, a Black Orpington, owned by Mr. H. Spence, laid 225 first-grade eggs, the highest individual score in Section "B" and for the competition.

The Narrogin School of Agriculture secured first place with hen No. 143, in Section "A," with 220 first-grade eggs to its credit.

In the Duck Section, Mr. F. B. Pepper's team obtained first place with 1,191 2oz. eggs and over.

The winter test (April 10th to July 9th) finished as follows:—

Section "B."—A. F. Lethbridge, 327 first-grade eggs.
Section "A."—R. A. Dusting, 239 first-grade eggs.
Section "C."—F. B. Pepper, 390 2oz. and over eggs.

Fawn and White Indian Runner Ducks—Winners in Section "C."
(Laid 1,412 eggs, 2ozs. and over.)
Owner: Mr. F. B. Pepper, Osborne Park.

Section "B."—Black Orpington Hen, No. 57.
(Highest individual score—laid 225 1st grade eggs.)
Owner: Mr. H. Spence, Rivervale.

Table No. 1 shows the performance of every team in order of merit.

For the purpose of this competition during the first month a first-grade egg weighed 1¾ozs. and over, and thereafter 2ozs. and over. Only first grade eggs are counted. At any period of the test a second-grade egg had to weigh not more than ¼oz. less than a first-grade egg. Second-grade eggs are recorded, but not counted.

All eggs laid individually weighed at Muresk test.

The cost of feeding averaged 8s. 3d. per bird for the term of the competition.

Table No. 2 gives the monthly production in every section in first-grade, second-grade, and under-weight eggs, followed by the percentage of the various grades to the total output of eggs in each section as well as for the competition.

Section "A."—White Leghorn Hen, No. 143.
Highest individual score—laid 220 1st grade eggs.)
Owner: School of Agriculture, Narrogin.

The table in question indicates that the heavy breed laid:—

(1) More eggs than the light breeds.

(2) A larger percentage of first-grade eggs and a smaller proportion of second-grades than the latter.

(3) A slightly higher percentage of under-weight eggs than Section "A."

The monthly production shows that the number of first-grade eggs increases till the peak production (August) is reached, when their numbers keep decreasing monthly till the end of the competition. On the other hand the second-grade eggs reach their maximum output in November for the light breeds and September for the heavy breeds, while the under-sized eggs are greatest in November and October respectively. As will be noticed, the difference in monthly output of second-grade between October and January is so slight that every or any of those months may be considered the peak period.

TABLE No. 1.

No. 2 MURESK EGG LAYING COMPETITION, 1928–1929.

GROUP PENS—FINAL RESULTS.

Section "A."	1st.	2nd.	Section "B."	1st.	2nd.
Dusting, R. A. ...	928	338	Russell, J. W. ...	1,066	99
Pineapple P.F. ...	830	331	Lethbridge, A. F. ...	1,012	110
Brocklehurst, F. ...	802	326	Pelvaurm P.F. ...	847	222
Muja P.F.	697	480	Spence, H.	829	67
Pelvaurm P.F. ...	669	135	Caversham P.F. ...	795	542
Love, M.	666	536	Morningside P.F. ...	756	292
Morningside P.F. ...	657	487	Pelvaurm P.F. (R.I.R.) ...	729	232
Elfdale P.F. ...	601	403	Thompson, G. S. ...	719	253
Paramount P.F. ...	597	598	Neavedale P.F. (2) ...	674	401
Aiken, M.	589	588	Aldervale P.F. (1) ...	666	552
Neavedale P.F. (1) ...	581	112	Mardia P.F. ...	642	535
Neavedale P.F. (2) ...	575	460	Love, M.	617	491
Boulter, T.	570	346	Parkinson, T. ...	616	653
Swanson, H.	556	572	Yaldarra P.F. ...	612	364
Narrogin, S. of Agric.	549	448	Robinson, D. F. ...	593	466
Parkinson, T.	510	358	Windyridge P.F. ...	571	557
Trevor P.F.	500	600	McDonald, N. ...	521	458
Love, A. B.	495	744	Auburn P.F. ...	502	513
Walker, M. (2) ...	470	760	Pineapple P.F. ...	486	677
Priestley, J.	459	607	Elfdale P.F. ...	478	727
Walker, M. (1) ...	447	734	Neavedale P.F. (1) ...	403	316
Russell, J. W. ...	432	608	Aldervale P.F. (3) ...	350	853
Yaldarra P.F. ...	344	877	Aldervale P.F. (2) ...	234	659
	13,524	11,448		14,718	10,039

Section "C."	1st.	2nd.
Pepper, F. B. ...	1,412	45
Martin, E. R. ...	1,191	15
Pepper, M. A. ...	1,183	7
Dusting, R. A. ...	1,157	26
	4,943	93

TABLE No. 2.

MONTHLY PRODUCTION.

	Section "A."				Section "B."			
	1st.	2nd.	Under weight.	Total Eggs.	1st	2nd.	Under weight.	Total Eggs.
April	781	432	36	1,249	916	257	32	1,205
May	790	1,044	202	2,036	1,339	929	170	2,438
June	668	948	95	1,711	1,043	1,003	157	2,203
July	1,384	883	18	2,285	1,557	1,014	69	2,640
August	1,791	940	20	2,751	1,719	1,038	94	2,851
September	1,688	995	36	2,719	1,681	1,096	94	2,871
October	1,392	1,288	92	2,772	1,423	1,068	126	2,617
November	1,280	1,329	145	2,754	1,304	972	123	2,399
December	1,200	1,262	138	2,600	1,245	860	124	2,229
January	1,160	1,122	86	2,368	1,111	799	125	2,035
February	854	831	56	1,741	808	662	114	1,584
March	536	374	7	917	572	341	40	953
	13,524	11,448	931	25,903	14,718	10,039	1,268	26,025

	Sections "A" and "B."				Section "C."		
	1st.	2nd.	Under weight.	Total Eggs.	1st.	2nd.	Total Eggs.
April	1,697	689	68	2,454	209	40	249
May	2,129	1,973	372	4,474	464	3	467
June	1,711	1,951	252	3,914	421	...	421
July	2,941	1,897	87	4,925	394	1	395
August	3,510	1,978	114	5,602	400	1	401
September	3,369	2,091	130	5,590	563	6	569
October	2,815	2,356	218	5,389	516	29	545
November	2,584	2,301	268	5,153	543	3	546
December	2,445	2,122	262	4,829	565	1	566
January	2,271	1,921	211	4,403	497	8	505
February	1,662	1,493	170	4,325	287	1	288
March	1,108	715	47	1,870	84	...	84
	28,242	21,487	2,199	51,928	4,943	93	5,036

PERCENTAGE OF VARIOUS GRADES TO TOTAL OUTPUT OF EGGS.

	1st.	%	2nd.	%	Under weight.	%	2 ozs. and over.	%	Total, Eggs.
Section "A"	13,524	52·21	11,448	44·19	931	3·59	12,417	47·93	25,903
Section "B"	14.718	56·55	10.039	38·57	1,268	4·87	13,777	52·93	26,025
Sections "A" and "B"	28.242	54·38	21.487	41·38	2.199	4·23	26,194	50·44	51,928
Section "C"	4.943	98·15	93	1·84	...	...	4,943	98·15	5,036

No. 2 MURESK EGG LAYING COMPETITION, 1928-1929.

FROM 10TH APRIL, 1928, TO 17TH MARCH, 1929.

FINAL RESULTS—(INDIVIDUAL AND TEAMS).

SECTION "A" LIGHT BREEDS—(ALL WHITE LEGORNS).

Competitor.	Individual.					Group.			Remarks.
	Hen No.	1st	2nd	Under weight.	2 ozs. and over.	1st.	2nd.	Under weight.	
Neavedale P.F. (1) ...	1	71	9	...	69	...	...	...	Died, 10-2-28.
	2	139	43	1	139	...	...	...	
	3	141	7	...	137	...	...	...	
	4	186	18	...	176	...	...	...	
	5	...	13	2	...	...	...	...	Died, 27-7-28.
	6	44	22	...	37	581	112	3	Died, 3-11-28.
Brocklehurst, F. ...	7	156	26	2	149	...	...	...	
	8	84	158	...	70	...	...	...	
	9	139	93	2	126	...	...	...	
	10	124	5	...	115	...	...	...	
	11	137	16	...	132	...	...	...	
	12	162	28	1	155	802	326	5	
Paramount P.F. ...	13	2	188	58	1	...	...	...	
	14	124	49	1	118	...	...	...	
	15	207	6	...	201	...	...	...	
	16	63	166	9	48	...	...	...	
	17	52	129	11	36	...	...	...	
	18	149	60	2	149	597	598	81	
Priestley, J. ...	19	73	88	2	65	...	...	...	
	20	72	95	3	67	...	...	...	
	21	167	55	...	152	...	...	...	
	22	41	179	2	41	...	...	...	
	23	89	21	1	77	...	...	...	
	24	17	169	24	10	459	607	32	
Love, A. B. ...	25	29	186	13	21	...	...	...	
	26	146	24	2	136	...	...	...	
	27	85	116	6	74	...	...	...	
	28	125	68	...	114	...	...	...	
	29	48	192	17	28	...	...	...	
	30	62	158	2	48	495	744	40	
Parkinson, T. ...	31	18	133	47	14	...	...	...	
	32	166	45	...	149	...	...	...	
	33	...	60	12	...	...	...	...	
	34	169	15	...	165	...	...	...	
	35	145	2	...	145	...	...	...	Died, 30-12-28.
	36	12	103	19	2	510	358	78	
Morningside P.F. ...	37	51	125	18	51	...	...	...	
	38	122	64	2	110	...	...	...	
	39	3	203	32	3	...	...	...	
	40	113	36	...	113	...	...	...	
	41	180	29	...	172	...	...	...	
	42	188	30	...	170	657	487	52	
Dusting, R. A. ...	43	167	23	2	156	...	...	...	
	44	90	29	...	74	...	...	...	
	45	200	26	1	181	...	...	...	
	46	145	111	...	133	...	...	...	
	47	147	99	1	131	...	...	...	
	48	179	50	...	157	928	338	4	
Pineapple P.F. ...	49	94	85	...	91	...	...	...	
	50	163	18	...	156	...	...	...	
	51	159	26	...	150	...	...	...	
	52	197	2	...	186	...	...	...	
	53	111	94	...	100	...	...	...	
	54	106	106	...	102	830	331	...	
Swanson, H. ...	55	102	96	...	91	...	...	...	
	56	112	58	1	108	...	...	...	
	57	123	13	...	106	...	...	...	
	58	9	216	21	5	...	...	...	
	59	17	185	25	17	...	...	...	
	60	193	4	...	189	556	572	47	
Yaldarra P.F. ...	61	3	181	31	3	...	...	...	
	62	19	193	13	19	...	...	...	
	63	73	98	3	73	...	...	...	
	64	78	157	1	57	...	...	...	
	65	127	105	1	124	...	...	...	
	66	44	143	3	39	344	877	52	

No. 2 MURESK EGG LAYING COMPETITION, 1928-1929—*continued.*
FINAL RESULTS—INDIVIDUAL AND TEAMS—*continued.*

Competitor.	Individual.					Group.			Remarks.
	Hen No.	1st.	2nd.	Under weight.	2 ozs. and over.	1st.	2nd.	Under weight.	
Tr vor P.F. ...	67	117	32	1	110	...	...	...	
	68	140	60	...	130	...	...	...	
	69	50	120	28	34	...	...	...	
	70	27	188	7	21	...	...	...	
	71	55	165	12	43	...	...	...	
	72	111	35	...	99	500	600	48	
Aiken, M.	73	13	187	38	9	...	...	...	
	74	166	41	1	165	...	...	...	
	75	60	124	5	48	...	...	...	Died, 30-12-28.
	76	165	16	1	155	...	...	...	
	77	104	120	2	95	...	...	...	
	78	81	100	5	79	589	588	52	
Walker, M. (1) ...	79	7	195	23	7	...	...	...	
	80	103	55	...	89	...	...	...	
	81	142	70	...	130	...	...	...	
	82	26	130	13	26	...	...	...	
	83	71	146	9	62	...	...	...	
	84	98	138	2	86	447	734	47	
Russell, J. W. ...	85	22	166	34	22	...	...	...	
	86	117	82	6	116	...	...	...	
	87	41	9	...	41	...	...	...	
	88	11	175	42	11	...	...	...	
	89	113	97	3	104	...	...	...	
	90	128	79	...	116	432	608	85	
Muja P.F. ...	133	152	2	1	152	...	...	...	
	134	7	171	44	...	...	...	...	
	135	187	36	...	166	...	...	...	
	136	141	23	...	125	...	...	...	
	137	150	80	1	134	...	...	...	
	138	60	168	3	2	697	480	49	
Narrogin School of Agriculture	139	5	75	64	1	...	...	...	
	140	51	164	11	49	...	...	...	
	141	163	30	...	154	...	...	...	
	142	2	87	27	2	...	...	...	
	143	220	11	...	201	...	...	...	
	144	108	81	2	92	549	448	104	
Walker, M. (2) ...	145	131	74	1	116	...	...	...	
	146	132	92	1	118	...	...	...	
	147	151	90	1	134	...	...	...	
	148	2	156	14	2	...	...	...	
	149	8	200	33	8	...	...	...	
	150	46	148	11	42	470	760	61	
Pelvaurm P.F. ...	151	82	3	...	82	...	...	...	
	152	180	15	...	170	...	...	...	
	153	147	3	...	131	...	...	...	
	154	95	78	1	80	...	...	...	
	155	101	36	...	101	...	...	...	
	156	64	...	...	64	669	135	1	
Neavedale P.F. (2) ...	157	171	5	...	152	...	...	...	
	158	95	101	1	88	...	...	...	
	159	62	26	1	62	...	...	...	
	160	171	30	...	155	...	...	...	
	161	55	146	6	50	...	...	...	
	162	21	152	4	15	575	460	12	
Elfdale P.F. ...	163	146	17	1	146	...	...	...	
	164	175	27	...	173	...	...	...	
	165	79	33	...	79	...	...	...	
	166	24	174	9	17	...	...	...	
	167	160	3	...	160	...	...	...	
	168	17	149	35	3	601	403	45	
Boulter, T.	169	149	57	...	131	...	...	...	
	170	111	56	1	99	...	...	...	
	171	127	34	...	123	...	...	...	
	172	27	21	2	20	...	...	...	
	173	44	90	1	44	...	...	...	Died, 19-11-28.
	174	112	88	1	94	570	346	5	
Love, M.	175	40	170	8	31	...	...	...	
	176	94	97	...	86	...	...	...	
	177	89	125	1	72	...	...	...	
	178	152	14	...	146	...	...	...	
	179	139	88	...	119	...	...	...	
	180	152	42	2	145	666	536	11	

SECTION "B."—HEAVY BREEDS.

Competitor.	Hen No.	1st.	2nd.	Under weight.	2 ozs. and over.	1st.	2nd.	Under weight.	Remarks.
Aldervale P.F. (1)	1	182	50	1	175	...	..	...	
	2	129	76	...	126	...	...	...	
	3	139	45	1	127	...	...	..	
	4	3	203	39	...	...	...	...	
	5	169	55	...	149	...	...	...	Died, 13-2-29.
	6	44	123	...	43	666	552	41	
Elfdale P.F. ...	7	38	202	3	38	...	...	...	
	8	175	47	1	174	...	...	...	
	9	170	26	2	170	...	...	...	
	10	12	235	5	12	...	...	...	
	11	32	58	19	13	...	...	...	
	12	51	159	31	48	478	727	61	
Mardia P.F. ...	13	108	35	3	95	...	...	...	
	14	11	170	43	1	...	...	...	
	15	154	30	1	134	...	...	...	
	16	158	100	2	133	...	...	...	
	17	25	177	13	9	...	...	...	
	18	186	23	3	176	642	535	65	
Neavedale P.F. (1)	19	20	123	7	1	...	...	...	
	20	17	158	44	4	...	...	...	Died, 19-10-28.
	21	140	19	1	133	...	...	...	
	22	67	...	...	65	...	...	...	
	23	39	14	1	27	...	...	...	
	24	120	2	1	120	403	316	54	
Pineapple P.F. ...	25	158	46	1	141	...	...	...	
	26	39	166	21	30	...	...	...	
	27	34	157	8	23	...	...	...	
	28	22	173	5	17	...	...	...	
	29	126	58	...	120	...	...	...	
	30	107	77	...	105	486	677	35	
Auburn P.F. ...	31	15	170	37	5	...	...	...	
	32	142	124	1	119	...	...	...	
	33	5	115	112	2	...	...	...	
	34	151	...	...	149	...	...	...	
	35	89	103	2	86	...	...	...	
	36	100	1	...	100	502	513	152	Died, 30-12-28.
Caversham P.F. ...	37	169	67	2	161	...	...	...	
	38	105	110	10	185	...	...	...	
	39	82	94	2	81	...	...	...	
	40	109	129	...	93	...	...	...	
	41	150	109	2	127	...	...	...	
	42	180	33	...	174	795	542	16	
Aldervale P.F. ...	43	3	119	172	1	...	...	.	
	44	79	129	1	64	...	...	.	
	45	22	132	40	13	...	...	...	
	46	1	36	141	1	...	...	...	Died, 30-1-29.
	47	1	148	82	1	...	...	437	
Love M.	48	128	95	1	128	234	659	...	
	49	164	8	...	155	...	...	...	
	50	46	121	...	31	...	...	...	
	51	134	27	1	131	...	...	...	
	52	35	211	6	13	...	...	...	
	53	75	105	7	60	...	...	14	
Spence H.	54	163	19	...	163	617	491	...	
	55	6	1	...	6	...	...	...	
	56	193	1	...	193	...	...	...	
	57	225	4	...	221	...	..	...	
	58	144	9	2	141	..	...	..	
	59	130	19	2	127	...	...	5	
Parkinson T. ...	60	131	33	1	130	829	67	..	
	61	17	208	8	2	...	...	...	
	62	45	128	18	27	...	...	...	
	63	148	97	...	130	...	...	...	
	64	102	77	3	95	...	...	..	
	65	86	139	4	70	...	...	33	
Windyridge P.F. ...	66	218	4	...	216	616	653	...	
	73	108	118	...	90	...	...	.	
	74	1	124	68	1	..	..	...	
	75	152	35	...	147	..	...	...	
	76	110	134	...	97	..	..	...	
	77	163	17	...	159	...	...	72	

SECTION "B"—HEAVY BREEDS—*continued.*

Competitor.	Hen No.	1st.	2nd.	Under weight.	2 ozs. and over.	1st.	2nd.	Under weight.	Remarks.
Morningside P.F. ...	78	37	129	4	17	571	557	...	
	79	146	72	1	142	...	...	...	
	80	156	37	...	142	...	...	...	
	81	76	69	3	69	...	...	...	
	82	46	66	12	30	...	...	...	
	83	166	29	...	160	...	...	17	
Aldervale P.F. ...	84	166	19	1	165	756	292	...	
	85	6	191	35	5	...	...	...	
	86	63	135	2	63	...	...	...	
	87	16	161	50	7	...	...	...	
	88	45	152	3	44	...	...	...	
	89	197	60	2	187	...	...	...	
	90	23	154	32	19	350	853	124	
Russell, J. W. ...	91	209	1	...	208	...	...	...	
	92	171	5	...	168	...	...	...	
	93	210	...	...	207	...	...	...	
	94	85	87	7	78	...	...	...	
	95	190	6	...	189	...	...	...	
	96	201	...	...	199	1,066	99	7	
Lethbridge, A. F. ...	97	204	...	...	203	...	...	...	
	98	152	4	...	152	...	...	...	
	99	143	9	...	141	...	...	...	
	100	216	13	...	214	...	...	...	
	101	129	41	...	114	...	...	...	
	102	168	43	...	159	1,012	110	...	
Neavedale P.F. (2)	103	126	106	1	106	...	...	...	
	104	159	...	...	159	...	...	...	
	105	10	6	...	5	...	...	...	
	106	201	...	...	201	...	...	...	Died, 20-9-28.
	107	156	76	...	154	...	...	...	
	108	22	213	34	4	674	401	35	
Yaldarra P.F. ...	109	64	118	4	53	...	...	...	
	110	89	28	1	75	...	...	...	
	111	164	21	...	160	...	...	...	
	112	21	161	31	12	...	...	...	
	113	156	6	1	152	...	...	...	
	114	118	30	...	115	612	364	37	
Thompson, G. S. ...	115	132	...	...	131	...	...	...	
	116	125	24	...	119	...	...	...	
	117	183	14	...	180	...	...	...	
	118	116	64	5	111	...	...	...	
	119	32	150	12	12	...	...	...	
	120	131	1	...	128	719	253	17	
Pelvaurm P.F. ...	121	118	67	1	108	...	...	...	
	122	60	113	...	49	...	...	...	
	123	161	21	...	154	...	...	...	
	124	181	3	1	179	...	...	...	
	125	161	17	...	158	...	...	...	
	126	166	1	...	164	847	222	2	
Robinson, D. F. ...	127	153	35	1	143	...	...	...	
	128	140	80	...	124	...	...	...	
	129	128	58	1	124	...	...	...	
	130	99	30	2	90	...	...	...	
	131	43	155	25	25	...	...	...	
	132	30	108	6	21	593	460	35	
Pelvaurm P.F. (R.I.R.)	133	170	8	...	169	...	...	...	
	134	152	13	...	152	...	...	...	
	135	138	37	1	129	...	...	...	
	136	82	42	1	82	...	...	...	
	137	52	55	1	39	...	...	...	
	138	135	77	...	119	729	232	3	
McDonald, N. ...	139	33	140	3	31	...	...	...	
	140	42	39	...	42	...	...	...	
	141	128	62	1	105	...	...	...	
	142	136	76	2	132	...	...	...	
	143	117	34	...	110	...	...	...	
	144	65	107	...	65	521	458	6	

SECTION "C."—DUCKS—(6 Birds, Group tested.)

Martin, E. R. ...	1	1,191	15	...	1191	...	...		
Pepper, F. B. ...	2	1,412	45	...	1,412	...	...	...	
Pepper, M. A. ...	3	1,183	7	...	1,183	...	...		
Dusting, R. A. ...	4	1,157	26	...	1,157	...	...		

CULTIVATION OF ONIONS.

(Continued from March issue.)

E. T. MORGAN,
Vegetable Inspector.

PREPARATION OF LAND.

The preparation of the land for the reception of onion plants is of primary importance, as a good stand, and consequently a good crop will not be obtained from a cloddy paddock. The adage "as fine as an onion bed" is a true one, and in order to obtain a tilth corresponding to this description, such operations as ploughing, harrowing and levelling must be properly carried out. The exact number of times each operation should be performed is not important. One operation is a good as several if a satisfactory tilth is obtained. On the other hand, an indefinite number is not sufficient if the land is still loose, cloddy or uneven.

A sandy loam is usually brought into condition quite easily, but with a clay soil a much more difficult matter has to be faced, and such a soil should be worked as early in the season as possible, before heavy rains set in. It is a good plan to plough the land in the spring and allow it to lie fallow through the summer. At the period of the first rains, say in March, it will be found possible to cultivate the land and bring into good condition sooner than would be possible if left uncultivated until the early part of the growing season.

MANURING.

Onions, like most vegetable crops, need a complete fertiliser and adequate amounts of nitrogen, phosphoric acid and potash are especially important. Properly kept farmyard manures contain these elements, and if the onion-grower has command of a good supply of well-rotted manure, he is in a happy position. If the amount of stable manure is limited, a moderate dressing supplemented by a mixture of artificial fertiliser makes a very good combination. Most of our South-West growers, however, are unable to accumulate stocks of manure—owing to the animals not being stabled—and, therefore, have to rely solely on artificial fertilisers. Many growers follow the system of green manuring, although this is not carried out to the extent is should be. Ploughing in greenstuff is an effective method of improving the humus content of the soil, and as motor transport is rapidly doing away with the horse, this method of supplying humus must be much more resorted to among vegetable growers than is at present. Soil bacteria is much more active in a soil containing a large amount of decomposed vegetable matter, and hence the farmer who wishes to get the best return for his labour will endeavour to supply this very necessary agent.

As the onion is a long-growing plant, the application of a fertiliser containing bone dust, which is fairly slow acting, is good, and a mixture of 4 parts blood and bone, 2 parts of superphosphate, and 1 part of potash, and applied at the rate of 10 cwt. per acre has given satisfactory results. No. 3 or No. 4 Mt. Lyell and Brand "B" or "E" Cuming Smith's Potato Manures are much used, and are suitable fertilisers. This can be sown broadcast and well worked into the land prior to planting, or sown along

the furrow in the same manner as is usually done when planting potatoes This method is described later, under the heading of transplanting. It is advisable to topdress the plot when the onion bulbs are about one inch in diameter with one of the above mixtures, or a combination of 3 parts superphosphate and 1 part of sulphate of ammonia, applied at the rate of 1-1½ cwts. per acre.

It is not recommended that highly nitrogenous fertilisers be used in the early stages of growth, as these mixtures stimulate top growth and often cause thick stemmed or "bottle-necked" plants, which are not desirable and seldom produce good bulbs.

TRANSPLANTING.

When the plants are from 4-6 inches high, and are nice and sturdy, they are fit for transplanting. They should be dug from the bed, so as to injure the roots as little as possible. As the roots are fairly long, and it is not practicable to make a hole large enough to spread out these roots evenly, it is customary to trim them with a sharp knife to the length of approximately ¾ inch. As there is a balance between root and top to be maintained, it is reasonable to suggest that, as a compensation for this loss, a portion of the top should be cut off, and if an inch or so is removed this will conform to common practice. It is, of course, not suggested that each plant be treated separately, but if a handful of plants are placed on a board the operation can be quickly performed.

The rows should be marked out with the aid of a marker as previously described, but with the "tynes" 1 foot apart. If a line is laid out at one side of the area to be planted, and the outside tyne kept close to it—allowing 4 tynes to the structure—we have 4 rows one foot apart. Again, keeping the outside tyne in the last row marked, we have 3 more rows, and so on. Do not mark too deeply, as onion plants should be planted very shallow. A method often adopted in the South-Western portion of the State is to use the plough. A furrow is struck out, a dressing of fertiliser run along it fairly close to the surface, and another furrow turned over against it. The onion plants are then placed along the intersection of the two furrows, and if the ploughman is expert a straight row is the result. If the plough will turn a furrow of 11 or 12 inches, they may be planted one furrow apart, but if the plough will cut only a narrow width, it is advisable to allow two furrows between the rows. This method allows the planter to walk along the furrow, and so obviates the necessity for trampling the surface of the land during the planting operation; a great advantage if the land is inclined to be wet. If the paddock has been well prepared previous to the transplanting operation, it should plough back very level, and a drag or wheel hoe run along between the rows will leave the plot in good order.

VARIETIES.

The following varieties are recommended:—

Brown Spanish.—The best known variety in cultivation; it is most popular for general use. A good grower and keeper.

Brown Globe.—An onion similar to Brown Spanish, but more globular. It shares the latter's popularity for weight-producing.

White Globe.—This is perhaps the finest white onion at present in existence. Bulbs of medium size, mild flavour and juicy.

New Queen.—A silver-skinned onion of quick growth and mild flavour. It is often grown for producing an early crop.

Early Barletta.—The earliest white onion grown. It is not a good keeper, but sown early is very profitable.

CULTIVATION.

Much of the success of the onion crop depends on the amount and efficiency of the cultivation. Cultivation has a twofold purpose; it breaks the crust that has formed because of heavy rains, and also keeps down weeds. Onions cannot compete against weeds, which rob them of nourishment, water and sunlight; hence, the crop must be kept absolutely clean. Wheel hoes are most extensively used for cultivation between the rows, but they cannot remove weeds from between the plants in the rows. This must be done by hand, a tedious process, but an essential one. Small hoes are obtainable 2½-3 inches wide. If the plants are placed about 4 inches apart, this width will allow the effective use of one of these hoes between them. Some growers prefer to allow sufficient width between the rows to allow of horse cultivation. This will tend to decrease the cost of cultivation, but care should be taken not to throw the soil too far and cover the developing bulbs. Onion bulbs develop best when near the surface of the ground, and will not grow as large nor be as good keepers if buried deeply in the soil.

HARVESTING.

Onions take from six to seven months to reach complete development. Bending the stems over is a great aid to ripening; a light roller drawn over them is sometimes used, and it is quite effective. It is not wise to allow the onions to remain in the ground long after the tops have died down as there is always danger of sunburn, and harvesting takes place during the hot weather. When the tops have yellowed and turned down the bulbs should be lifted and carted to a shady place, preferably an open shed, and spread out thinly, taking care not to bruise the bulbs, or decay will soon set in. An ideal way of harvesting is to place the onions in crates; they can then be stacked one on top of the other, and the air circulating through the slatted sides cures them slowly and effectively. When the tops are dry and shrivelled the onions are fit for market, and no fear need be felt as to their carrying qualities. Growers of very early crops often pull the onions when they have reached a marketable size, and cut off the tops about an inch above the bulb. The onions are quite green, but are fit for immediate use, and when prices are high and where the grower is near the market—as they do not carry well—it no doubt pays him, but for the average onion grower it pays to properly harvest the onion before marketing.

SUMMARY.

1. It is desirable for the grower to have seed grown under his own supervision.
2. Great importance is attached to the selection of mother bulbs.
3. Correct fertilising is necessary.
4. The land should be kept free from weeds during the growing period.
5. Harvesting practices should be planned so as to avoid sun-burned and immature bulbs.

FIELD EXPERIMENTS WITH WHEAT.

AVONDALE STATE FARM.

A. S. Wild, Agricultural Adviser.
H. J. Bailey, Farm Manager.

During 1928 five experiments with wheat were conducted at this farm. They were:—

1. Rate of Seeding Experiment.
2. Basic Slag and Superphosphate Experiment.
3. Rate of Superphosphate Experiment.
4. Time of Application of Superphosphate Experiment.
5. Liming Experiment.

The land on which the experiments were conducted was typical York Gum and Jam country which had been cleared a number of years. It had been ploughed during the previous July to a depth of four to five inches with a mouldboard plough, spring-tyne cultivated in February and again immediately prior to drilling.

Each plot was one-eighth of an acre in area and repeated to form five sections for each experiment, except the Liming Experiment, which was in triplicate.

The monthly rainfalls as recorded at Beverley, four miles distant, are set out hereunder:—

—	Jan.	Feb.	Mch.	Apl.	Useful Rains.							Nov.	Dec.	Total for Year.
					May.	June.	July.	Aug.	Sept.	Oct.	Total.			
1928 ...	56	..	18	44	146	145	564	331	141	41	1,368	3	31	1,520
Average 43 years	31	42	64	87	218	317	329	248	170	99	1,381	45	40	1,690

The rainfall recorded during the growing period (May to October) was about equal to the average. However both May and June were unusually dry, these months being followed by a period of heavy soaking rains. These terminated abruptly in September and a dry period was experienced at the end of September and during the month of October.

The dry spell in May did not allow for an efficient cultivation of the fallowed land to control weeds, the growth of which was assisted by the heavy rains in July.

Under these conditions, crops grown with seed applied in quantities larger than usual gave better returns. Weeds were placed at a disadvantage in liberally seeded crops and the losses through malting and other causes were not felt so appreciably.

RATE OF SEEDING EXPERIMENT.

In this experiment the midseason variety, "Nabawa" was planted at three different rates, viz., 90 lbs., 45 lbs., and 60 lbs. per acre. The results obtained together with the average percentage results for the past three years are set out hereunder:—

AVONDALE STATE FARM.

RATE OF SEEDING EXPERIMENT.

GRAIN YIELDS.

Variety—Nabawa. Rate of Superphosphate 100lbs. per acre. Planted 10th May, 1928.

Rate of Seed per Acre.	Computed Yield per Acre.										Average Yield, per Acre.	Percentage, 1928.	Percentage, 1926–28.
	Sec. 1.		Sec. 2.		Sec. 3.		Sec. 4.		Sec. 5.				
	bus.	lbs.	bus.	lbs.	bus.	lbs.	bus.	lbs.	but.	lbs.	bus.	lbs.			
90lbs.	20	55	21	55	21	40	20	3	20	3	20	55	127	114
45lbs. (Control) ...	16	44	17	36	16	44	15	8	15	59	16	26	100	100
60lbs.	19	56	19	26	18	6	18	6	15	38	18	14	111	107

The above results conclusively indicate that, under the conditions of growth at the Avondale State Farm, applications of seed heavier than 45 lbs. per acre are profitable. The results at the experimental farms situated in portions of the Wheat Belt, other than the Great Southern, are equally conclusive in establishing that 45 lbs. per acre of seed of the variety Nabawa is sufficient.

BASIC SLAG AND SUPERPHOSPHATE EXPERIMENT.

As in previous years this experiment was carried out with 22 per cent. superphosphate and 17 per cent. basic slag (Thomas Phosphate.)

It was designed to ascertain the advantage, if any, obtained when phosphoric acid was applied to the soil in basic slag, as compared with phosphoric acid when applied in superphosphate.

The plots were arranged so that both the amount (by weight) and the quality (percentage of phosphoric acid) of the fertiliser applied per acre were compared with 22 per cent. superphosphate, the principal fertiliser used by wheat farmers.

To meet these requirements three plots were planted, viz.:—

1. 75 lbs. per acre of 17 per cent. basic slag (equal by weight to control.)
2. 75 lbs. per acre of 22 per cent. superphosphate (control).
3. 97 lbs. per acre of 17 per cent. basic slag (supplying the same amount of phosphoric acid as 75 lbs. of superphosphate.)

The area of each lot was one-eighth of an acre, and each section was repeated five times.

There was a marked difference between the plots throughout the growing period, these differences being indicated in the subsequent grain yields

which together with the averaged results for the past three years, are set out in the table hereunder:—

AVONDALE STATE FARM.

BASIC SLAG AND SUPERPHOSPHATE EXPERIMENT.

GRAIN YIELDS.

Variety—Nabawa. Rate of Seed 45lbs. per acre. Planted 12th May, 1928

Rate of Fertiliser per Acre.	Relative quantities Phosphoric Acid per acre.	Computed Yields per Acre.					Average Yield per Acre.	Per-centage Yield, 1928.	Per-centage Yield, 1926–28.
		Sec. 1.	Sec. 2.	Sec. 3.	Sec. 4.	Sec. 5.			
	%	bus. lbs.	bus. lbs.	bus. lbs.	bus. lbs.	bus. lbs.	bus. lbs.		
97lbs., 17 % Basic Slag	100	12 55	12 55	12 26	12 19	9 21	11 59	83	83
75lbs., 22 % Super-phosphate	100	14 39	14 16	15 8	14 46	13 47	14 31	100	100
75lbs., 17 % Basic Slag	77	12 55	12 26	13 32	11 49	10 50	12 18	85	81

Although there is not a great difference in the results obtained from the plots receiving the two different rates of basic slag, there is, however, a considerable difference between these and the control plot of 75 lbs. of superphosphate, and it can be concluded from these results that the wheat plants' requirement of phosphoric acid is best supplied by superphosphate.

RATES OF SUPERPHOSPHATE EXPERIMENT.

The midseason variety Nabawa was also planted in this experiment and was sown at the rate of 45 lbs. per acre.

The results obtained this year, together with the average percentage results for the past three years are as hereunder:—

AVONDALE STATE FARM.

RATE OF SUPERPHOSPHATE EXPERIMENT.

GRAIN YIELDS.

Variety—Nabawa. Rate of Seed—45lbs. per acre. Planted 11th May, 1928.

Rate of Superphosphate per acre.	Computed Yield per Acre.			Average Yield per acre.	Percentage Yield, 1928.	Percentage Yield, 1926–28.
	Section 2.	Section 3.	Section 4.			
	bus. lbs.	bus. lbs.	bus. lbs.	bus. lbs.		
225 lbs.	14 13	13 58	13 3	13 45	102	106
75 lbs. (Control)	13 35	13 20	13 28	13 28	100	100
150 lbs.	14 58	13 28	13 43	14 3	104	107

It was obvious that the yields obtained from some of the plots in Sections 1 and 5 had been affected by some unaccountable factor, and consequently they are not used for comparison.

These results show that better yields are obtained when the rate of superphosphate is increased above 75 lbs. per acre.

TIME OF APPLICATION OF SUPERPHOSPHATE EXPERIMENT.

The object of this experiment which was commenced in 1928 is to determine whether, when applying heavy dressings of superphosphate it would be economical to apply part or all of the fertiliser when cultivating during the late summer or early autumn months.

The times of applying the superphosphate and the results for the season are as hereunder:—

AVONDALE STATE FARM.

TIME OF APPLICATION OF SUPERPHOSPHATE EXPERIMENT.

GRAIN YIELDS.

Variety—Nabawa. Seed—45lbs. per acre. Planted 10th May, 1928.

Time of Application of Superphosphate.	Computed Yields per Acre.										Average Yield per Acre.		Percentage Yield, 1928.
	Sec. 1.		Sec. 2.		Sec. 3.		Sec. 4.		Sec. 5.				
	bus.	lbs.	bus.	lbs.	bus.	lbs.	bus.	lbs.	bus.	lbs.	bus.	lbs.	
75 lbs. in March ... 150 lbs. at planting ...	10	50	10	58	12	28	11	43	9	51	11	10	111
25 lbs. in March	9	26	10	21	11	58	9	58	8	44	10	5	100
150 lbs. in March ... 75 lbs. at planting ...	10	58	10	21	11	28	10	58	10	58	10	57	109

These results are undoubtedly in favour of those plots which received dressings of superphosphate at seeding time. They indicate, as do the results of similar experiments conducted at the other experiment farms, that the wheat yields are decreased when portion of the fertiliser is not applied at seeding time.

LIMING EXPERIMENT.

The object of this experiment is to ascertain whether an application of agricultural lime at the rate of 10 cwts. per acre is advantageous for the wheat crop.

This lime was applied a month prior to seeding, viz., on the 15th April, 1928. This procedure enabled the lime to commence its actions on the soil and also safeguarded the superphosphate (applied at seeding) from undue interference, and consequent "reversion." All plots were planted with the variety "Nabawa" and superphosphate was applied at the rate of 100 lbs. per acre.

The results obtained for this year together with the average results for 1927-28 are as hereunder:—

AVONDALE STATE FARM.

LIMING EXPERIMENT.

GRAIN YIELDS.

Variety—Nabawa. Rate of Seed —45lbs. per acre. Rate of Superphosphate—100lbs. per acre. Planted 10th May, 1928.

Lime applied.	Computed Yield per Acre.						Average Yield per acre.		Percentage Yield, 1928.	Average Percentage Yield, 1927-28.
	Section 1.		Section 2.		Section 3.					
	bus.	lbs.	bus.	lbs.	bus.	lbs.	bus.	lbs.		
10cwt. per acre	11	21	12	13	13	28	12	21	99	95
No lime	11	36	12	58	12	58	12	31	100	100

These results, which are for two years only do not, so far, indicate that lime, when applied in the autumn prior to seeding to this class of soil, has a beneficial effect on the wheat crop.

FIELD EXPERIMENTS WITH WHEAT AT THE SALMON GUMS EXPERIMENT FARM.

I. THOMAS, Superintendent of Wheat Farms.

L. SENIOR, Farm Manager.

In addition to the results already published in the March issue of the *Journal of Agriculture* the following field experiments were conducted at the Salmon Gums Experiment Farm during 1928:—

FALLOW AND NON-FALLOW EXPERIMENT.

EARLY OR LATE FALLOWING EXPERIMENT.

The following table shows the monthly rainfall for 1928, together with the average as officially recorded at Salmon Gums, one mile distant from the farm:—

--	Jan.	Feb.	Mar.	Apl.	Growing Period.						Total.	Nov.	Dec.	Total for Year.
					May	June	July	Aug.	Sep.	Oct.				
1928 ...	60	6	65	72	60	50	145	140	91	93	579	...	10	792
Average 10 years	22	48	118	117	157	144	137	136	126	136	836	70	82	1 293

The rainfalls during the growing periods May-October for each of the past ten years, 1919-1928, are set out hereunder, together with corresponding annual rainfalls:—

——	1919.	1920.	1921.	1922.	1923.	1924.	1925.	1926.	1927.	1928.
May October ...	726	955	1,203	1,030	845	832	750	725	744	579
Jan.-December ...	1,584	1,298	1,546	1,427	1,413	1,181	1,433	1,263	1,165	792

FALLOW AND NON-FALLOW EXPERIMENT.

This experiment was carried out in order to obtain a comparison of the yields from new land cropped after being prepared for seeding by ploughing during the previous winter months, with land cropped after a cultivation prior to seeding only.

The land in which the experiment was conducted was Gimlet, Black Mallee and Silver-bark country, cleared in 1926/27 by rolling and burning.

The fallowed plots were ploughed with a disc implement during July 1927. They received no further attention until prior to seeding, when along with the unfallowed plots, they were cultivated with a springtyne implement.

The results obtained were as follow:—

TABLE 10.

FALLOW AND NON-FALLOW EXPERIMENT.

PLANTED 28TH MAY, 1928.

Variety—Gluyas Early. Seed—45lbs. per acre. Superphosphate (22%) 90lbs. per acre

FALLOW.	NON-FALLOW.
Average of Plots 1 and 3.	Plot 2.
bus. lbs.	bus. lbs.
13 11	6 27
100 %	49 %

The difference in yields of the plots is considerable and although the results are for one year only they confirm in no uncertain manner the information obtained elsewhere, viz., that the yields are considerably increased by fallowing the land for the wheat crop.

EARLY OR LATE FALLOWING EXPERIMENT.

The object of this experiment is to ascertain whether the time of carrying out the initial operation of fallowing, *i.e.*, ploughing, has any effect upon the yields of the resultant wheat crop.

For the purpose of the experiment, three plots, repeated so as to give five sections, were required. It was intended that the respective plots should be ploughed during March, June and September, but the ploughing of the March plot was unavoidably delayed until May.

The ploughing was carried out with a disc implement to a depth of 4 inches. Apart from the ploughing, all plots received similar treatment.

In September they were cultivated with a disc implement and during the last week in October they were harrowed. During January they were springtyne cultivated and this cultivation was repeated immediately prior to seeding.

TABLE 6.

SALMON GUMS EXPERIMENT FARM.

EARLY OR LATE FALLOWING EXPERIMENT.

Planted 14th May, 1928.

Variety—Nabawa. Seed—45lbs. per acre. Superphosphate (22%) 90lbs. per acre.

Time of Ploughing.	Computed Yields per acre.										Average Yield, 1928.		Percentage Yield, 1928.
	Sec. 1.		Sec. 2.		Sec. 3.		Sec. 4.		Sec. 5.				
	bus.	lbs.	bus.	lbs.	bus.	lbs.	bus.	lbs.	bus.	lbs.	bus.	lbs.	
May	19	36	17	4	13	4	15	36	13	44	15	52	100
June	20	0	16	16	15	4	14	32	13	36	15	52	100
September ...	17	12	15	4	15	20	12	32	14	8	14	48	93

From these results which are for one year only, it would appear that the yields are increased when the land is ploughed during the early winter months. These results also confirm the results obtained from a somewhat similar experiment conducted at the Merredin Experiment Farm.

FIELD EXPERIMENTS WITH WHEAT AT THE YILGARN EXPERIMENT FARM.

I. Thomas, Superintendent of Wheat Farms.
G. K. Stevens, Farm Manager.

In addition to the results already published in the March issue of the Journal of Agriculture, the following field experiments were conducted at the Yilgarn Experiment Farm, during 1928:—

MULCHING EXPERIMENT.

Below are tabulated the monthly rainfalls recorded at the farm for 1928, together with the monthly averages for the past 35 years as recorded at Southern Cross, a distance of eight miles west of the farm:—

—	Jan	Feb.	Mch.	Apl.	Growing Period.							Nov.	Dec.	Total for Year.
					May.	June.	July.	Aug.	Sept.	Oct.	Total.			
1928 ...	92	...	62	50	170	76	165	89	48	8	556	...	57	817
Average 35 years	47	57	86	73	143	143	146	115	76	62	685	45	48	1,041

MULCHING EXPERIMENT.

The object of this experiment is to determine how far and under what conditions the cultivation of winter fallowed land is profitable during the spring and summer months.

It was conducted at this farm for the first time last season, the land which had originally carried heavy Ginlet and Salmon Gum timber, being prepared as follows:—

All the plots were ploughed with a disc cultivating plough during the July of the previous year. Plots 1 and 2 received a cultivation with a spring-tyne implement in the middle of September. The plots which were to be cultivated after rain during summer were so treated on five occasions, towards the end of September, the second week in October, and during the last weeks of December, January and March.

Owing to the formation of a hard crust on the plots which were not cultivated during the summer, the whole series was cultivated during May and again immediately before drilling.

The results obtained are set out below.

YILGARN EXPERIMENT FARM.—MULCHING EXPERIMENT.

Variety—Gluyas Early. Seed—43lbs. per acre. Planted 10th May, 1928. Suprephosphate—75lbs. per acre.

Treatment.	Computed Yield per Acre.										Average Yields, 1928.		Percentage Yields, 1928.
	Sec. 1.		Sec. 2.		Sec. 3.		Sec. 4.		Sec. 5.				
	bus.	lbs.	bus.	lbs.	bus.	lbs.	bus.	lbs.	bus.	lbs.	bus.	lbs.	
Cultivated in Spring, after summer rains and before planting	21	52	20	48	21	52	22	13	24	0	22	9	108
Cultivated in spring and before planting only	17	57	20	59	21	9	20	26	21	41	20	26	100
Cultivated before planting only	18	29	21	20	21	52	22	12	21	41	21	7	103

The results from those plots receiving cultivations after summer rains show an increase over those from plots not so treated. However, as the returns are for one year only, definite conclusions cannot as yet be drawn.

FIELD EXPERIMENTS WITH WHEAT AT THE CHAPMAN EXPERIMENT FARM.

I. THOMAS, Superintendent of Wheat Farms.
P. JEFFREY, Farm Manager.

In addition to the results already published in the March issue of the "Journal of Agriculture," the following field experiments were conducted at the Chapman Experiment Farm last year:—

Depth of Ploughing Experiment.
Mulching Experiment.

The following table shows the monthly rainfall recorded at the farm during the year, together with the averages for the past 23 years:—

—	Jan.	Feb.	Mch.	Apl.	Growing Period.							Nov.	Dec.	Total for Year.
					May.	June.	July.	Aug.	Sept.	Oct.	Total.			
1928 ...	56	...	40	35	315	262	603	243	139	85	1,647	4	7	1,789
Average 23 years	27	50	69	43	227	432	394	264	172	97	1,586	26	29	1,830

DEPTH OF PLOUGHING EXPERIMENT.

This experiment was conducted on land which was ploughed to the respective depths during September, 1927, with a mouldboard plough. The plots were cultivated with a springtyne implement during October, 1927, again in March, 1928, and also immediately prior to seeding. Owing to the cloddy nature of the land disc harrows preceded the drill.

This experiment is designed to determine the comparative effects upon the resulting crop of ploughing at different depths. For the purpose of the experiment three plots were required, which were ploughed as follows:—

Plot 1.—4 inches, representing shallow ploughing.
Plot 2.—6 inches, representing medium ploughing.
Plot 3.—8 inches, representing deep ploughing.

The plots were each one-eighth of an acre in area, and were repeated five times.

The seed was planted in a dry seed bed. Germination was good, and the plots throughout their growth presented an even appearance.

The results obtained this year, together with the average results for the past 12 years, are as follow:—

DEPTH OF PLOUGHING EXPERIMENT.

Variety—Nabawa. Planted 18th May, 1929. 45lbs. Seed per acre. 112lbs. Superphosphate (22%) per acre.

Plot No.	Depth of Ploughing.	Computed Yields per Acre.					Average Yield per Acre, 1928.	Percentage Yield, 1928.	Average Percentage Yield 1915-28.
		Sec. 1.	Sec. 2.	Sec. 3.	Sec. 4.	Sec. 5.			
		bus. lbs.	bus. lbs.	bus. lbs.	bus. lbs.	bus. lbs.	bus. lbs.		
1	4 inches	18 32	23 4	20 40	19 44	18 56	20 8	97	101
2	6 „	19 4	21 44	23 20	19 28	19 28	20 40	100	100
3	8 „	21 4	21 20	20 56	16 24	18 40	19 36	95	103

The results for this year are slightly in favour of the six-inch ploughing. The average results for the past ten years demonstrate, however, that no economic advantage is to be gained by ploughing to a depth greater than four inches.

MULCHING EXPERIMENT.

The object of this experiment is to determine how far and under what conditions the cultivation of winter fallowed land is profitable during the spring and summer months.

The experiment has been conducted since 1914, and as in previous years the following system of cultivation was adopted:—

Plot 1.—Cultivated during spring, again when required during summer after 25 points of rain or over, and again prior to seeding, the object being to maintain a mulch throughout the fallowed period and to destroy weed growth.

Plot 2.—Cultivated during spring and prior to seeding only (ordinary fallow).

Plot 3.—Cultivated prior to seeding only (neglected fallow).

The land upon which the experiment was conducted was originally lightly timbered with Jam (*Acacia acuminata*), and at the time of planting was rather loose owing to the absence of summer and early autumn rains.

The land was ploughed during August, 1927, with a mouldboard plough to a depth of four inches. The plots received the necessary cultivations mentioned above, the plots in the first section being cultivated seven times during the summer. The seed was sown on a dry seed bed, no weed growth being in evidence at that time. However, the plots which had been cultivated prior to planting only were rather cloddy.

The results obtained are as given below:—

CHAPMAN EXPERIMENTAL FARM.

MULCHING EXPERIMENT.

Variety—Nabawa. Seed—45lbs. per acre. Superphosphate (22 %) 112lbs. per acre. Planted 18th May, 1928.

Plot No.	Treatment.	Computed Yields per Acre.					Average Yield, 1928.	Average Percentage Yield, 1928.	Average Percentage Yield, 1914–28.
		Sec. 1.	Sec. 2.	Sec. 3.	Sec. 4.	Sec. 5.			
		bus. lbs.	bus. lbs.	bus. lbs.	bus. lbs.	bus. lbs.	bus. lbs.		
1	Cultivated in spring, after summer rains and before planting	15 52	16 8	16 8	16 0	15 44	16 0	111	108
2	Cultivated in spring and before seeding	15 12	15 28	13 20	14 32	13 36	14 24	100	100
3	Cultivated before seeding only	14 48	16 40	13 4	14 48	14 32	14 48	103	90

Although the results are somewhat uneven it must be remembered that last season was unusual as regards rainfall. No rain of any consequence fell until the third week in May, but such heavy rains were experienced after that that the ground soon became waterlogged.

Both the results of this year and the average results over the past 14 years are in favour of the plots cultivated in spring, after summer rains and before planting, though this year the increase does not appear to warrant the extra cost of so many cultivations.

FIELD EXPERIMENTS WITH WHEAT AT THE MERREDIN EXPERIMENT FARM.

I. THOMAS, Superintendent of Wheat Farms.
J. LANGFIELD, Farm Manager.

In addition to the results already published in the March issue of the *Journal of Agriculture*, the following field experiments were conducted at the Merredin Experiment Farm last year—

Depth of Ploughing Experiment
Mulching Experiment
Early or Late Fallowing Experiment.

The land upon which the experiments were conducted was typical Gimlet and Salmon Gum forest country.

The monthly rainfall recorded at the farm for 1928, together with the average for 17 years, is as follows:—

					Growing Period.									
—	Jan.	Feb.	Mar.	Apl.	May	June	July	Aug.	Sep.	Oct.	Total May to Oct.	Nov.	Dec.	Yearly total.
1928 ...	39	...	101	58	76	107	224	154	71	19	651	...	24	873
Average 17 years	56	50	113	76	124	174	186	135	97	80	796	36	59	1 186

EARLY OR LATE FALLOWING EXPERIMENT.

The object of this experiment is to determine whether the time of fallowing has any effect on the resultant wheat crop on heavy forest land.

This is the fifth year that the experiment has been conducted.

Two plots were used, each half an acre in area, one-eighth of an acre of each being cut for hay and the remaining three-eighths of an acre harvested for grain. The early fallowed plot was ploughed during the first week of June and the late fallowed plot during the last week in August, 1927. A heavy disc implement was used, the land being ploughed to a depth of four inches.

The land ploughed in June turned over very well, but that ploughed in August was inclined to be hard and lumpy.

Both plots were cultivated with a springtyne implement during September, harrowed after rain at the end of March, cultivated with a disc implement in April and again with a springtyne prior to seeding.

The tabulated results are as follow—

TABLE A.

EARLY OR LATE FALLOWING EXPERIMENT.

PLANTED 25TH APRIL, 1928.

Variety—Nabawa. Seed—43lbs. per acre. Superphosphate (22%) 120lbs. per acre.

HAY YIELDS.

Date fallowed.	Computed yields per acre, 1928.	Percentage, 1928.	Average, 5 years.	Percentage, 5 years.
	cwts. qrs. lbs.		cwts. qrs. lbs	
First week in June ...	31 0 16	100	37 0 6	100
Third week in August ...	29 2 16	95	31 1 14	85

GRAIN YIELDS.

Date fallowed.	Computed yield per acre, 1928.	Percentage, 1928.	Average, 5 years.	Percentage, 5 years.
	bus. lbs.		bus. lbs.	
First week in June ...	18 18	100	21 20	100
Third week in August ...	12 11	67	16 52	79

The results for this year and the average results for the past five years are strongly in favour of the practice of early fallowing both for hay and grain. Some of the advantages of early fallowing are—

1. Easier ploughing.

2. A better chance is afforded for the destruction of weeds.

3. More moisture is conserved in normal years by the longer period, thus providing a better insurance against dry spells at critical times.

4. Early fallowing renders it possible to work the soil down to a better tilth, resulting in an even and strong germination.

5. It stimulates the formation of nitrates and sweetens and aerates the soil.

6. Observations have shown that fallowing helps to check "Take-all."

7. Increased yields result. Over a period of five years the early fallow has given an increased yield of 5 cwts. 2 qrs. 20 lbs. for hay and 4 bus. 28 lbs. for grain per acre.

DEPTH OF PLOUGHING EXPERIMENT.

The object of this experiment, which has been conducted continuously for the past 14 years, is to determine the comparative effect upon resulting crops of ploughing the land to different depths. Three plots were required for the experiment and were ploughed as follows:—

Plot 1—4 ins. representing shallow ploughing.

Plot 2—6 ins. representing medium ploughing.

Plot 3—8 ins. representing deep ploughing.

The plots were each 1/8 acre in area and were repeated five times. The land, which had previously carried Salmon Gum and Gimlet timber, was ploughed to the different depths during June, 1927, with a disc plough. It was cultivated with a springtyne implement during September, harrowed during the first week in April after a fall of 84 points of rain and cultivated again with a tandem disc implement during the second week in April. Germination was good, but, owing to a dry spell, little growth was made during the first three weeks.

During the winter months the crop made excellent growth, but was checked by the dry spell in September. As a result, the ears did not develop normally and the grain was somewhat pinched.

The results are as follow:—

TABLE B.

DEPTH OF PLOUGHING EXPERIMENT.

PLANTED 25TH APRIL, 1928.

Variety—"Nabawa." Seed—43lbs. per acre. Superphosphate (22%) 120lbs. per acre.

Treatment.	Computed Yield per acre.					Average Yield, 1928.	Percentage Yield, 1928.	Percentage Yield, 14 yrs.
	Sec. 1.	Sec. 2.	Sec. 3.	Sec. 4.	Sec. 5.			
	bus. lbs.	bus. lbs.	bus. lbs.	bus. lbs.	bus. lbs.	bus. lbs.		
Ploughed—								
4ins. deep	22 56	20 56	18 48	20 16	19 52	20 32	98	104
6ins. deep	23 28	21 4	21 28	19 12	20 24	21 4	100	100
8ins. deep	21 44	19 28	22 24	20 16	18 48	20 32	98	100

The yields obtained from the plots this year are again very even. Although the plots ploughed 6 inches deep show a slight advantage over those ploughed 4 inches deep, the average results for the past 14 years go to show that no advantage is to be derived from ploughing to a depth greater than 4 inches.

MERREDIN EXPERIMENT FARM.

MULCHING EXPERIMENT.

The object of this experiment is to determine how far and under what conditions the cultivation of winter fallowed land is profitable during the spring and summer months. The land on which the experiment was conducted was ploughed in June 1927 to a depth of 4 inches.

Three plots were necessary and to meet the requirements of the experiment they were treated as follows:—

Plot No. 1.—Cultivated during spring, again when required during summer after 25 points of rain or over, and again prior to seeding, the object being to maintain a mulch throughout the fallowed period and to destroy weed growth.

Plot No. 2—Cultivated during spring and prior to seeding only (ordinary fallow).

Plot No. 3—Cultivated prior to seeding only (neglected fallow).

The land upon which the experiment was conducted was typical Salmon Gum and Gimlet timber country.

Plot 1 this year received a cultivation in December, this being the only occasion during the summer on which a serviceable rain was recorded.

All the plots were harrowed the first week in April after rain. They were then cross cultivated during the second week in April with a tandem disc and springtyne cultivated prior to seeding.

The germination was very irregular, but was better on plots 1 and 2 than on plot 3.

The results obtained are as follow:—

TABLE C.

MULCHING EXPERIMENTS.

PLANTED 30TH APRIL, 1928.

Variety—Nabawa. Seed—43lbs. per acre. Superphosphate (22%) 120lbs. per acre.

Treatment.	Computed Yields per acre.					Average Yield, 1928.	Percentage Yield, 1928.	Average Percentage Yield, 1915-28.
	Sec. 1.	Sec. 2.	Sec. 3.	Sec. 4.	Sec. 5.			
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.		
Mulched in spring, after rain during summer and before planting	15 4	18 32	18 0	20 24	17 12	17 52	111	103
Mulched in spring, and before seeding	15 4	15 20	15 52	16 32	17 44	16 8	100	100
Mulched before seeding only	14 40	14 24	14 56	13 36	15 36	14 40	91	95

The yield from the plot that was cultivated in spring, after rain during summer and prior to planting, shows an increase of 11% over the plot that was only cultivated in spring and prior to planting. This difference is greater than might have been expected in view of the fact that the former plot only received one cultivation during the summer, that being after a fall of 24 points in December.

Laboratory analyses of the soils of these two plots, carried out by Dr. Teakle in connection with his investigations of this problem throughout the growing period, showed little difference in moisture content. The plot cultivated through the summer had a slight advantage in nitrate content during the middle and later stage of the growing period, and because of this a slight increase in yield would be expected.

The percentage results for the past 13 years indicate that the general practice should be to cultivate the fallow during spring and again prior to seeding. In cases where the ground is weedy, this cultivation should be supplemented by additional cultivations after rain during the summer months. These not only destroy weed growth, but also assist to conserve moisture and control "Take-all."

MINERALS IN PASTURES AND THEIR RELATION TO ANIMAL NUTRITION.

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(A Review by H. W. Bennetts and L. J. H. Teakle.)

This book, published by H. K. Lewis & Co., Ltd., London, 1929, is the result of inquiries of the Sub-Committee of Experts appointed by the Civil Research Committee of the Cabinet, Great Britain.

The search of the literature was carried out by Miss H. Scherbatoff, under the direction of Dr. Orr. The information obtained, supplemented by a fund of information acquired as a result of personal contacts with workers in all parts of the British Empire and throughout the world, has been published by Dr. Orr in the book under review.

As most farmers are vitally interested in the question, it has been deemed advisable to review briefly the information from the local aspect pending a study of the work itself by those sufficiently interested in this subject to secure it.

THE PASTURES OF THE EMPIRE.

The importance of the pastures of the Empire may be gauged from the fact that the value of the grassland products annually consumed in Britain amounts to £426,000,000. More than half of these are imported. Of the total value of exports from Australia, 60 per cent. is from grassland products.

These exports constitute a drain on the soil, and provision must be made to maintain or increase the supply of available soil minerals or malnutrition in animals will result, and assume increased proportions on account of mineral deficiencies in the pasture. It has been calculated that the soil of Victoria has been depleted to the extent of 360,000 tons of phosphoric acid during the last 60 years; 2,000,000 tons of superphosphate would need to be added to the soil to restore the pasture lands to the condition they were in about 1860.

MINERAL CONTENT OF PASTURES.

Pastures are not likely to be deficient in starches, sugars, proteins, etc., but the most frequent trouble is a deficiency in the mineral nutrients.

Diseases such as Pica (depraved appetite), coastiness, bush sickness in New Zealand, wobbles, rickets, etc., are often manifestations of a deficient mineral diet.

De Saussure, a Swiss, in 1804 published a book in which he showed that the ash of plants varied with the nature of the soil and the stage of growth of the plants. Later work was done in England, France, Germany and the United States of America, and there is now considerable reliable information on the mineral contents of pastures of recognised values for feeding purposes. It is found that good cultivated pasture contains approximately the same amounts of minerals as an amount of milk of equivalent food (calorific) value. Other foods differ markedly, and are usually deficient in one or more minerals. Thus wheat is particularly deficient in

calcium (lime) and sodium. Molasses is rich in all minerals except phosphate. This is shown in Table 1, copied from Table 3, page 11. The information in the table is of considerable value, not only to the investigator, but to the stockman who finds it necessary to supplement the natural food for his stock.

TABLE 1.

(Copied from Table 3, p. 11.)

COMPARISON OF MINERAL CONTENT OF GOOD PASTURE WITH THAT OF SOME OTHER FOODSTUFFS, WITH MILK AS A STANDARD.

1,000 CALORIES CONTAIN THE FOLLOWING AMOUNTS IN GRAMS.

	CaO. (Lime.)	P_2O_5. (Phosphoric Acid.)	Na_2O. (Soda.)	K_2O. (Potash.)	Cl. (Chlorine.)	N. Nitrogen.
Cows' Milk	2·38	3·43	0·81	3·21	1·4	8·32
Good pasture	3·64	2·75	0·94	11·54	3·5	10·40
Maize	0·03	1·83	0·13	1·36	0·001	4·64
Wheat	0·14	2·75	0·13	1·59	0·2	5·60
Potatoes	0·28	1·60	0·49	5·56	0·3	3·36
Turnips	1·18	1·96	0·33	5·40	0·42	3·87
Decorticated Cotton Cake ...	1·22	11·26	0·24	8·05	0·11	26·32
Molasses	5·35	0·56	1·02	10·26	3·56	4·23

It is not difficult to judge the quality of a pasture if it is carrying stock. The carrying capacity and the condition of the stock are infallible guides. It is found that there is a close correlation between quality and mineral content of pastures. This is shown by the extracts in Table 2.

TABLE 2.

(Abstracted from Table IV. p. 13.)

AVERAGE MINERAL CONTENT OF DIFFERENT TYPES OF PASTURE.

(PER CENT. DRY MATTER.)

Type of Pasture.	Ash. Silica free.	CaO. (Lime.)	P_2O_5. (Phosphoric Acid.)	Na_2O. (Soda.)	K_2O. (Potash.)	Cl. (Chlorine.)	N. (Nitrogen.)
Good cultivated (England and Scotland)	6·64	1·00	0·74	0·25	3·18	0·95	2·83
Good natural (England and Scotland)	5·85	0·65	0·67	0·37	2·66	0·64	2·50
Poor natural (England and Scotland)	5·49	0·56	0·60	0·41	2·60	0·60	2·54
Deficient (Island of Lewis) ...	...	0·29	0·24	0·38	0·68	0·12	1·34
Deficient (Falkland Islands) ...	4·56	0·29	0·54	0·31	2·20	0·70	1·95

The pasture from the Island of Lewis is deficient in both lime, phosphate and potash.

The Falkland Islands are deficient in lime. A stunting of the animals on these islands is, no doubt, due to the lack of lime in the pastures.

It is well known that top-dressed pastures are "sweeter," and that the stock prefer the grass to that which has not been treated. It is also found that stock prefer certain areas. Analysis shows that the pastures preferred are richer in minerals. Table 3 illustrates this fact.

TABLE 3.

(Abstracted from Table V., page 15.)

AVERAGE COMPOSITION OF SCOTCH HILL PASTURES.

(PER CENT. DRY MATTER.)

	Ash. Silica free.	CaO. (Lime.)	P_2O_5. (Phosphoric Acid.)	Na_2O. (Soda.)	K_2O. (Potash.)	Cl. (Chlorine.)	N. (Nitrogen.)
Grass eaten	5·49	0·56	0·60	0·41	2·60	0·60	2·54
Grass not eaten	3·13	0·30	0·37	0·17	1·61	0·33	1·82

In certain areas pastures are deficient in individual minerals. Thus the Falkland Island pastures are deficient in lime. Australian and South African pastures are often deficient in phosphate. Data from various parts of the world are summarised in Table 4.

TABLE 4.

(Abstracted from Tables VIII., p. 19, p. 61, p. 63-4, p. 65, p. 92. p. 93.)

COMPOSITION OF PASTURES AS AFFECTING THE PHOSPHATE NUTRITION OF ANIMALS.

Locality.	Authority.	Type of Pasture.	Disease.	P_2O_5. (Phosphoric Acid) per cent.
Kenya Colony ...	Rowett Institute	... ...	... ...	0·19 to 0·32
Do.	Orr	... ...	Malnutrition ...	0·19
			Normal ...	**0·93**
South Africa ...	Theiler et al ...	Natural	Styfsiekte ...	0·07 to 0·32
Australia:				
Victoria	Kincaid	Native	... ...	0·099 to 0·299
Victoria	Cherry	Tree grass ...	... ...	0·129
		Kangaroo grass ...	... ...	0·122
		Tussock	... ...	0·170
New South Wales	Henry	Natural	Osteomalacia ...	0·28
			Normal ...	**0·56**
Victoria	Audas	Grey bush—		
		(Kochia pyramidala)	... ...	1·48
		Old Man Salt bush—		
		(A. mummuluria)	... ...	1·28
Western Australia	Underwood ...	Good	... ...	0·27 to 0·55
		Poor	... ...	0·15 ,, 0·23
Europe:				
Westphalia ...	Roloff	Meadow Hay ...	Brittle bone ...	0·26
			Normal ...	**0·48**
General	(22)	Hay	Brittle bone ...	0·26
	(11)	... ...	Normal ...	**0·52**
Norway	Tuff	Hay	Osteomalacia ...	0·17
			Normal ...	**0·50**

The figures for *normal* pastures are underlined.

Of great interest are the figures for salt bush and grey bush, which contain about 5 to 10 times as much phosphate as do the natural grasses in Australia.

Deficiency diseases caused by lack of iron are known to occur in New Zealand, Scotland and Tasmania.

Lack of iodine is of importance in Canada and parts of Africa. Many other elements, manganese, boron, copper fluorine, aluminium, etc., are required in small amounts, and are obtained from the soil through the plant or drinking-water. No information is available to show the absolute requirements of the elements.

FACTORS AFFECTING MINERAL CONTENT OF PASTURES.

The content of minerals in pasture and, therefore, the value of the pasture in the mineral nutrition of the grazing animal, depends on—

1. Species of plants.
2. Stage of growth of plants.
3. Climatic conditions.
4. Nature of the soil.

Species of Plant.—The legumes are generally richer in minerals than are the grasses, and this applies in particular to lime and sulphur. The ash of grasses is relatively richer in phosphates when compared with legumes. The sulphur content of legumes, particularly lucerne, is of significance in wool production. The value of mixed pastures is evident as the different types of plants supplement each other, and there is less danger of deficiencies.

TABLE 5.

(Abstracted from Table 16, p. 34.)

PER CENT. DRY MATTER.

	K_2O. (Potash.)	CaO. (Lime).	P_2O_5. (Phosphoric Acid.)	SO_3. (Sulphuric Acid).
Timothy	1·55	0·11	0·40	0·19
Clover	2·10	1·50	0·40	0·23
Lucerne...	2·25	1·76	0·56	0·40
Vetch	2·06	1·12	0·58	0·24

Seasonal Variation and Stage of Growth.—In general, it is found that young vigorous plants are richest in minerals. As they reach maturity and produce seeds the mineral contents decline as certain of the minerals, particularly phosphate and nitrogen, migrate to the seed. After the fall of the seeds the pasture is of poor quality, and usually deficient as a food. Recent studies by Sir Arnold Theiler and co-workers in South Africa (summer

growing season) show the marked change in mineral composition with season and maturity.

TABLE 6.

(Abstracted from p. 80.)

COMPOSITION OF DRY MATTER OF GRASS AT ARMOEDSVLAKTE.
PER CENT DRY MATTER.

Date of Sampling.	Protein.	Ash.	P_2O_5.	CaO.
November	19·4	11·6	0·60	0·31
December	14·3	7·7	0·32	0·59
January	13·8	7·7	0·22	0·50
March	7·2	5·9	0·24	0·43
April	4·9	6·1	0·11	0·43
May	4·1	5·9	0·07	0·50
June	4·0	7·2	0·09	0·59

This means that mineral supplements may be required in certain seasons and not in others. Analysis of the pasture must be undertaken to determine the mineral needs at different seasons.

Climatic Conditions.—Drought seriously affects the mineral content of pastures; in particular, phosphate absorption is seriously reduced. This means that in periods of drought, or semi-drought, the feed is not only less abundant, but also of poorer quality.

Nature of the Soil—Application of Fertilisers.—De Saussure, a century and a quarter ago, established the fact quantitatively that the ash content of plants differed in different soil types. Later it was found that fertilisers affect both the quantity and quality of herbage. In Western Australia pasture production is at least doubled as a result of superphosphate dressings, and the quality is improved. Richardson, in Victoria, found the following effects as a result of additions of fertilisers on a poor soil.

TABLE 7.

(Reproduced from page 45.)

EFFECT OF FERTILISERS ON YIELD AND MINERAL CONTENT OF HAY IN VICTORIA.

Fertiliser.	Hay.	Composition of Herbage per cent. dry matter.		
		Nitrogen.	P_2O_5. (Phosphoric Acid).	CaO. (Lime).
	cwts.			
No manure	23·2	1·46	0·27	0·60
1 cwt. superphosphate ...	43·7	2·28	0·59	1·47
1 cwt. superphosphate, plus 10 cwts. lime	62·1	2·20	0·46	1·44

On good soils, well supplied with phosphate, phosphatic fertilisers generally do not increase the phosphorus content of the herbage. On the poorer soil types not only is the chemical composition of pasture altered by fertiliser additions, but the botanical composition is changed. Leguminous plants are especially favoured by lime and phosphates, and a higher ratio of legumes means a higher ash content in the pasture.

CONDITIONS UNDER WHICH DISEASES DUE TO DEFICIENCY OF MINERALS IN PASTURES OCCUR.

"The mineral requirements of young animals depend upon their rate of growth."

The composition of milk is an indication of the requirements of the young animal of a particular species, and it has been shown that the milk of quick-growing animals is richer in minerals than that of slow growers. For example sow's milk contains approximately four times as much mineral as is found in human milk.

Improvement of breed (increased rate of growth) has usually been associated with improvement of pasture. If these improved breeds are introduced on to poor unimproved pastures (as in new countries), or on to old pastures which have been depleted in minerals by continuous grazing of animals with removal of animal products, milk, bones, etc., without compensating return of minerals to the soil; deterioration of breed results. The mortality rate also is increased.

The grading up of native stock with consequent increased mineral requirement must be correlated with grading of pastures, or trouble will result.

DEFICIENCY DISEASE IN GRAZING ANIMALS.

Much space is devoted to this question, but in this short review it is only possible to mention points which will be of special local interest.

Mineral deficiency of pasture may be so extreme that actual disease results, or, of such a degree that though no actual disease results the feeding value of the pasture is affected, with lower animal production.

The diseases due to mineral deficiencies in different parts of the world fall into definite groups.

1. *Those due to deficiency of phosphorus*—

   "Styfsiekte" in South Africa.

   "Coastal Disease" in Australia.

   "Dry Bible" or "Impaction Paralysis" (Carrion poisoning) in Australia and Tasmania; and "Lamsiekte" in South Africa are due primarily to phosphorus deficiency.

2. *Those due to deficiency of lime*—

   "Osteoporosis" or "Big Head" in horses. (Said not to be very common in Australia.)

3. *Those due to deficiency of iron—*

"Bush Sickness" in New Zealand, and a similar condition in King Island. (Cattle and Sheep.)

"Pining," a condition affecting sheep in Scotland.

This group is characterised by progressive anaemia and emaciation.

Diseases which are attributed to deficiency of either phosphorus or calcium in pasture are common in all States of Australia. A group of similar diseases known by various local names, "Coastal disease," "Cripples," etc., associated with unthriftiness, pica (depraved appetite), and the changes in the skeleton—soft bones, swollen joints, stiff gait, etc., are included here. These conditions resemble the "Styfsiekte" of South Africa, the primary cause of which has been shown to be phosphorus deficiency.

The condition known variously as "Dry Bible," "Impaction Paralysis" (Carrion poisoning) is a very common one in Australia, and is most probably the same disease as "Lamsiekte" of South Africa. This latter disease has been shown by Theiler to be primarily due to phosphorus deficiency. In both diseases the deficiency results in "Osteophagia" (bone chewing) in case of cattle, and sometimes sheep. The paralytic symptoms which sometimes follow this habit are due, as has been shown by Seddon in Australia and Theiler in South Africa, to the ingestion of poison of germs (Botulinus group) contained in some of the bones or carcases of animals which have been eaten.

(Note.—This disease has been described in this Journal in two articles dealing with "Toxic Paralysis" of Cattle and Sheep.)

The Osteophagia and consequent disease are prevented by feeding of phosphate-rich minerals such as bone meal. This treatment is also claimed to have a preventative influence on worm infection, and on some forms of sterility and abortion, now known to be due to mineral deficiency. The prevailing view is that there is a marked phosphate deficiency in the soil generally in Australia, and that this is "the chief root of evil of these deficiency diseases in stock." There is much evidence to support this view.

Soil analyses in Australia have shown that there is a marked phosphorus deficiency in soil in "bone chewing" areas. It has also been shown that Australian native grasses have a lower phosphorus content than the same kind of grass grown in Europe.

The almost universal response of vegetation to applications of superphosphate in Australia is also evidence of deficiency of phosphorus.

It is interesting to note that "salt bushes," which are known to have a marked beneficial effect on the health of stock have been found, on analysis, to be rich in phosphate and lime.

The rate of growth of horses is slower than that of cattle and sheep, so that diseases due to mineral deficiency are not so common in the former animal. The breeding and rearing of horses with good bone and stamina is, however, only successful in districts where pastures are rich in bone-forming elements. If horses are transferred to poor pasture the breed deteriorates as is said, by Cameron, to occur in English racehorses imported into Australia. This deterioration of progeny is attributed to phosphate deficiency in pastures.

INCREASED PRODUCTION AS A RESULT OF MINERAL FEEDING.

The diseases resulting from mineral deficiencies in pasture may be prevented—

1. By direct administrations of required minerals to the animal.
2. By enriching of pastures through mineral applications.

1. *Direct Administration.*

Sodium Chloride (common salt). The beneficial effect of feeding salt to stock has been known for centuries. In a hot climate a generous allowance is required, as much salt is lost with perspiration.

Lime and Phosphate.—The beneficial effect of feeding bone meal (supplying phosphate, lime and traces of other minerals) to stock depastured on phosphate-deficient country has been strikingly demonstrated by Theiler and others in South Africa.

(a) Increase in weight. The following table illustrates the increase in weight in young growing cattle fed bone meat at rate of 3oz. per day per head. Similar cattle grazing on the same pasture received no bone meal.

Increase in weight in lbs.—

	Bone Meal.		Nil.	
	No. 518.	No. 502.	No. 475.	No. 528.
Increase in weight in lbs. ..	445	442	146	154

(b) Increase in carcase value. The cattle fed on bone meal had more meat and fat in proportion to skeleton and entrails than those receiving no bone meal.

(c) Increased milk yield. Cows, on same phosphorus-deficient area, to which bone meal was fed showed a 40 per cent. increase in milk production, compared with controls receiving no bone meal.

(d) Increased resistance to disease. There was a decrease in mortality from disease generally in bone meal fed groups, as compared with controls which received no bone meal.

The above results illustrate the fact that preventative measures taken against mineral deficiency diseases result in increased growth and production in animals.

2. *Increasing Mineral Content of Pasture.*

Practically all pastures are capable of improvement as regards mineral content. This content can be increased by suitable mineral applications to the soil, and is followed by beneficial effects on stock. Both the yield and carrying capacity of pasture on cultivated lands are increased.

Of the two methods of increasing the mineral intake of grazing animals, the indirect method, viz., the application of mineral fertilisers to the soil is the better, because in addition to enriching the pasture in mineral nutrients it increases its feeding value in other ways.

In Australia the carrying capacity in some districts has been more than doubled by this method. Unfortunately, however, the improvement of Australian pastures tends to be accompanied by a deterioration in quality of wool, the resultant larger framed sheep carrying stronger wool.

One may conclude with a quotation from the book which sounds a note of warning, and at the same time illustrates the urgent need for research in this State.

> "Before administering mineral salts to grazing animals it is necessary to determine whether or not the pasture on which they are grazing is deficient, and, if so, the nature of the deficiency. The only method of determining this is by chemical analysis of the pasture."

SUMMARY.

1. Good cultivated pasture on which grazing animals thrive is rich in mineral nutrients, the amounts and proportions of these being similar to those found in cow's milk, when reckoned on the basis of equal calorific value.

2. Natural pastures are, as a rule, poorer in minerals; hence the general inferior feeding value of natural pastures.

3. Poor pastures may be generally deficient in minerals or deficient in one or other of the necessary minerals. The mineral content of pasture is affected by the species of plants, the season and stage of growth, climatic conditions—drought, and the nature of the soil—with or without fertiliser treatments. Pastures containing a variety of plant types are less likely to be deficient in feeding value than if one type of plant only is grown.

4. Australian pastures generally are deficient in phosphorus. Other deficiencies may occur, but are of less importance.

5. Deficiencies in iron, lime and iodine as well as phosphorus are known to occur in various parts of the world where stock are grazed.

6. Grazing of natural pasture invariably leads to soil exhaustion and a decline in feeding value of the pasture.

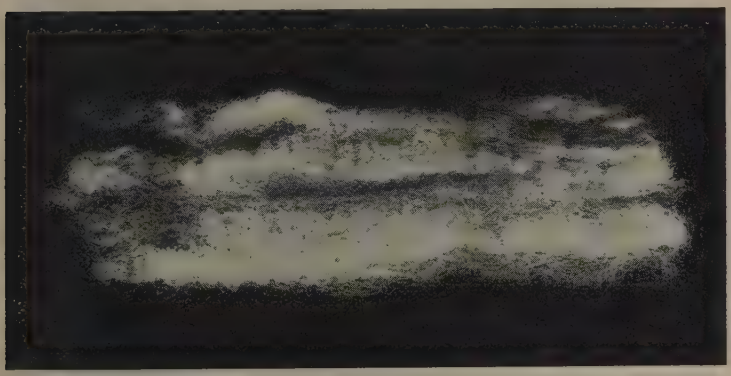
7. Top-dressing to supply the soil deficiencies is the best means of maintaining or improving the value of pastures.

8. Under pastoral conditions, feeding supplements in the form of mineral licks is the only economic way to supply the required salts. The nature of the deficiency should be ascertained before attempting to feed anything in the nature of a mineral mixture. This can be done only after a systematic examination of the pastures. The examination should be undertaken on representative soil types and at the different growth stages of the plant.

VARIATIONS IN WOOL FIBRE.

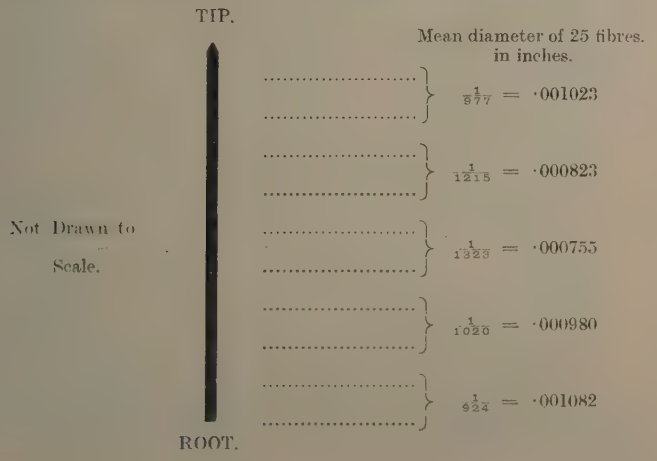
DUE TO VARIATIONS IN PASTURE.

During a visit to Bradford last year, Mr. E. H. B. Lefroy of Cranmore Park and the Boolardy Pastoral Company raised the question with Dr. Barker, the Director of Research at the British Research Society for the Woollen and Worsted Industries, as to whether, during periods of stress, the diameter of the fibre of the wool became less and the crimp smaller. No definite information was then available on this subject, but on Mr. Lefroy's return to Western Australia, a sample of wool was sent to Dr. Barker at Bradford, who passed it on to Professor Barker at the University of Leeds. A microscopical examination of the fibre was made and the following measurements and photographs supplied to Mr. Lefroy who has kindly made them available for publication as being of interest to sheep raisers.

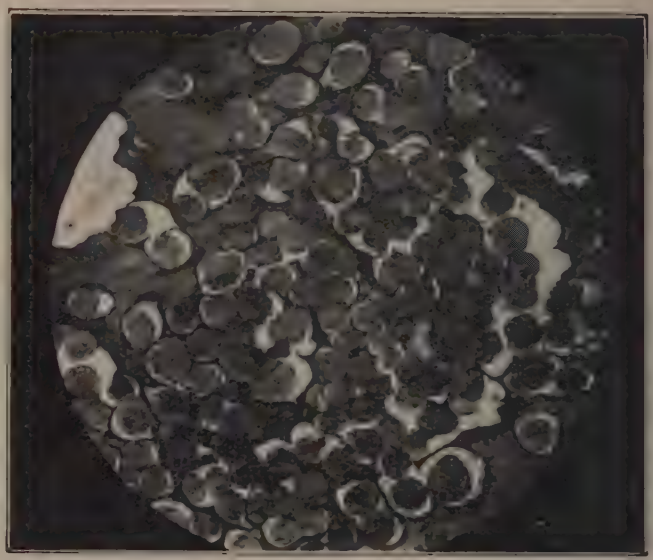


Sample of wool from the Boolardy Pastoral Company.

DIAGRAM OF DIAMETER ALONG FIBRES IN LOCK OF WOOL.



It is obvious, both by inspection and actual measurement, that there is considerable variation of diameter along the fibres of the sample lock, and that a thinner or finer portion exists in the centre portion of the lock. The tip is finer also than the root.



Micro-photographs: Transverse sections of wool fibres, showing variations in thickness.

Micro-photographs: Transverse sections of wool fibres, showing variations in thickness.

Micro-photographs of same wool fibres, showing variations in thickness towards tip, centre, and root.

MEASUREMENTS ON SAMPLE LOCK OF WOOL

CROSS SECTIONAL MEASUREMENTS (Mean of 50 Fibres).

Part of Lock.	Cross sectional area in square inches.	Circularity Ratio.	Crimps per inch.
Root	$\frac{1}{67567} = .0000148$	1·150	8·6
Middle	$\frac{1}{117647} = .0000085$	1·114	11·1
Tip	$\frac{1}{83333} = .0000120$	1·160	8·8

GEO. L. SUTTON.

CURCULIO BEETLE.

(*Otiorhynchus cribricollis.*)

A. Flintoff.

Among the insect pests with which orchardists in Western Australia have to contend, there is one that has, of late, come specially into prominence in the fruitgrowing areas of the South-West. This is commonly known as the "Curculio," and is a night-feeding beetle. As there are numerous beetles having similar characteristics and of varying sizes, it would be well for orchardists not familiar with the particular kind dealt with herein to forward any specimens of which they are doubtful to Mr. Newman, Government Entomologist, for identification. This officer is now actively engaged in tracing the life history of the Curculio Beetle, the habits of which are, in some stages, rather obscure. Until further knowledge of the life cycle is obtained, it is proposed here to give a record of observations as to the general form and habits of this pest, also a resumé of the work carried out during the present season for its control.

DESCRIPTION AND HABITS.

The beetle under review is a true weevil with full body tapering somewhat toward the head, about three-eighths of an inch in length, and of uniform colour, light to dark brown. It is a night-feeding beetle operating above ground from November to March or April, according to climatic conditions. The effect of its work is easily distinguishable, as it does not feed voraciously like the caterpillar and grasshopper, but more or less evenly serrates the leaves around the edges. It also nibbles the bark from stems of fruit, often completely ringing them, and damages fruit spurs and laterals in the same way. It will be further noticed that leaf stems are so bitten that the leaves either fall or hang loosely. Much damage is also done to fruit where such is clustered, forming a secluded hiding place, the beetles often remaining in these recesses during the day to again renew their depredations at nightfall. So far as is known this beetle, in the adult or summer stage, does not feed on the roots of trees or plants, confining its attention to over-surface vegetation: hence in our efforts toward control we should pay particular attention to keeping the orchard free from weeds during summer.

CONTROL.

So as not to appear in any way an alarmist I would point out that the beetle under review has been known in some orchards in the South-West for more than 20 years, and those orchards are still bearing good crops of fruit. It was found, however, that damage of more or less severity was done every year, and methods of control have been practised with results proportionate to the care taken. This season the pest has shown up in plague form, and the damage has been such that growers whose orchards have been affected are obliged to consider it of more than secondary importance.

As the control of each pest adds considerably to the cost of production I would urge growers to confer and decide on some uniform and econ-

omic method of control and prevention, for it is obvious that generally unchecked distribution would be a serious setback to fruitgrowers.

Many attempts have been made to destroy the Curculio Beetle, and some orchardists have been successful in so checking its inroads as to consider any damage done as negligible.

Perhaps the first recorded effort to control Curculio was that of Mr. G. W. Hester, of "Dalgarup Park," Bridgetown, who noticed the beetle entangled in sheep's wool. The idea occurred to him that a band of wool around the tree trunk would prevent ascent. The plan was only partially successful, as if the wool was not fleecy the insects could crawl over the band, and only a percentage become entangled. Recently the same orchardist tried a wool band, with wool about six inches in length, the band being affixed in such a way that the wool draped over in umbrella form. This proved very satisfactory.

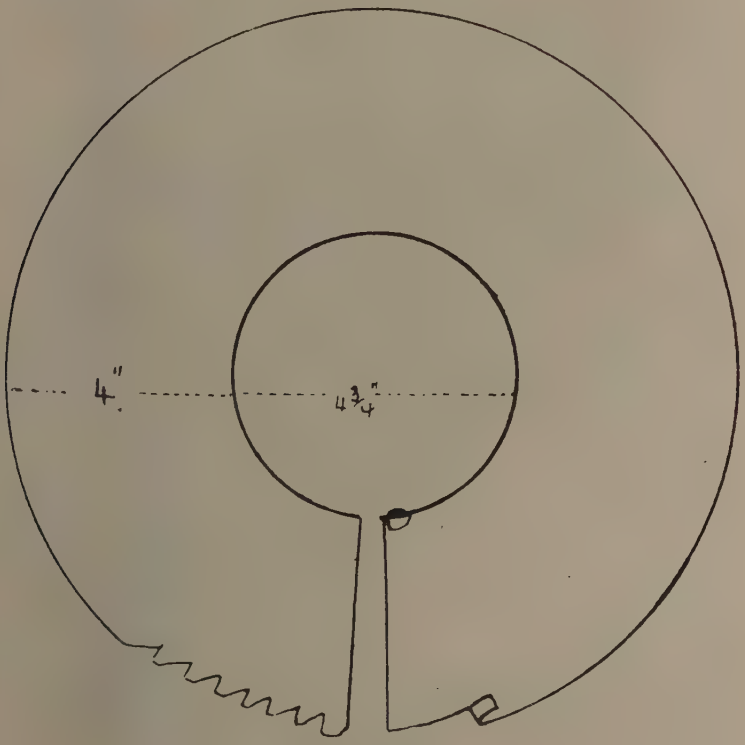
Poultry.—A striking example of successful control with poultry may be found in Mr. V. R. Johnston's orchard, "Cascades," Greenbushes, where the owner has fought the pest for years, trying out many methods, including poison bait, metal bands, etc. At length being convinced of the efficacy of poultry for the purpose of control, he set to work on the basis of ten fowls per acre, and has so perfected his plan as to be able to keep some 300 head continuously working in the orchard during the spring and summer months. Whether or not poultry would prove generally successful is a debatable point, and the efficacy of such a method would depend largely on the amount of care and enthusiasm of the individual orchardist.

Control by means of poultry as has been shown is successful, but requires an amount of concentration which the average orchardist may find irksome. In the first place one requires to arrange for the housing, feeding and watering of the birds in various parts of the plantation. With orchards up to five acres the one depot would suffice. Fowls of a foraging type should be used. Then from an economic view point it is obvious that the flock should be renewed every second year, and provision made for marketing eggs and birds so that the cost of installation and upkeep would, at least, be defrayed. Undoubtedly poultry, under right conditions, thrive, as the beetle is good food and, when finished feeding on the tree, return before morning to the ground, locating just beneath the surface soil, mostly near the tree trunk, thereby proving an easy victim to the active bird.

Wool Bands.—The present method of applying wool bands is to cut a strip of long wool sheep skin about one inch wide and affix to trunk of tree in such a manner as to prevent ascent except by traversing the fringe of wool. The beetle tries to do this, but the claw-like feet become entangled in the fine wool. I have seen upwards of 500 caught in this way. The Curculio does not fly, therefore, if this band is placed so there are no gaps, it proves an effective trap and, although a few do manage to get across, the damage done the tree, in any case, would be small. The cost of material would approximate 2d. per average sized tree, and might require renewal each year.

Care must be taken to ensure that the skin side of the wool band does not come in contact with the tree, as the oil in the skin will cause damage.

Poisonous Sprays.—Arsenical sprays have been used with good results, but the practice cannot be recommended as it would necessitate the tree being treated during January, February and March, having the effect of coating the fruit prior to picking, with a poisonous substance, the strength of which (1lb. of arsenate of lead paste to 8 gallons of water) would prevent its being exported. The cost of treatment would also be comparatively high. I would, however, recommend the poison spray for young, non-bearing trees which may be awkward for banding.

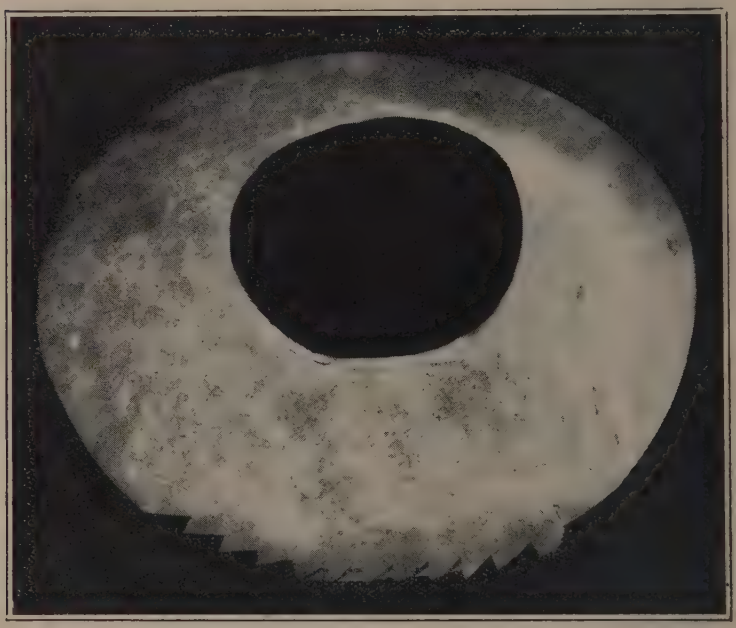


Pattern showing how band is cut from sheet of plain metal.

Poison Gas.—Bi-sulphide of carbon or other volatile poisons are also used, and as is well known to agriculturists, if applied so that the fumes impregnate the soil where insects are hiding, great numbers may be destroyed. So far, this method has not been tested out thoroughly, and the cost may, here again, be prohibitive if applied in sufficient quantity to effect control.

Metal-banding.—A method of control by banding with a strip of metal so placed on the trunk of tree as to stand out at an angle of about 45 degrees, and fitting close to the bark at the top, has been found effective. The band is cut from light galvanised flat iron, and the approximate cost of material per tree—fourpence—and would not require renewal unless damaged by

rough usage. In the early stages of experiment it was found necessary to increase the width of band to at least four inches, as a small percentage of beetles managed to cross narrower bands. To avoid the necessity of making a special band for each tree a series of notches, as shown in the illustration herewith, are cut on the outer edge with a simple catch for tightening, or removal at any time without undue waste of time. This arrangement permits of a stock size being used for tree trunks, varying two inches in circumference. The efficacy of this band is undoubted, as trees on which they were placed in December last remain free from injury while adjoining unbanded trees are severely damaged. Of course it will be understood that to prevent the weevil climbing up between the band and the tree trunk it is essential to first place a piece of sheep skin or bagging round the tree underneath the band.



Metal Band—Closed.

Recently photographs of banded and unbanded trees were secured, and although the full extent of the damage to the unbanded trees is not shown in the illustration, some idea of the benefit derived from the use of the band may be gained from a comparison of the two illustrations hereunder. As "metal banding" prevents the beetle climbing the tree, but does not destroy it, a poison bait lure has to be considered in conjunction, and it is suggested that a few leafy twigs or laterals of apple or other fruit tree be dipped in a poisonous solution and placed at the foot of the tree so that the Curculio, finding its food supplies cut off, will be attracted to the bait.

A grateful acknowledgment is made to those growers who co-operated in these experiments and assisted to bring them to a successful conclusion.

Banded tree in foreground showing prolific growth.

Showing trunks with metal bands on them.

Close view of unbanded tree adjacent to banded tree showing damage by Curculio.

DISTRICT CHALLENGE WHEAT YIELDS COMPETITION.

I. THOMAS, Superintendent of Wheat Farms.

The conditions governing this competition are:—

1. The competition is to be for a period of three years. The contestants are not individual farmers, but teams of five farmers belonging to the same district.

2. No farmer shall be eligible for inclusion in a team unless the area harvested by him for wheat grain each and every year during the competition is not less than 200 acres. The whole of the wheat crops on the farm are to be judged in this competition, and where the competitor has more than one farm in the same district, the total areas are to be treated as one entry.

3. A farm shall be deemed to be within a particular district when, in the opinion of the Director of Agriculture, such farm is within the zone of influence of the society nominating the team.

4. The awards are to be based on yield only, and the team of five which obtains the best average yield per acre for the three years, during which period the competition is held, shall be adjudged the winner. In the event of two or more teams securing the same average yield for this period the competition will be extended as far as these two teams are concerned until the average yield of the one over the whole period exceeds that of the other.

5. The method of judging to be as follows:—The judge is to visit the farm of each competitor, and at a convenient time measure up the stripping area and ascertain the quantity of wheat on hand. On or before January 31st the farmer will be required to furnish the judge with a sworn declaration as to the quantity of wheat sold from the competing holding, and the amount retained for seed and other purposes. The statement regarding the amount sold is to be supported by agents' dockets. The judge will satisfy himself as to the correctness of this statement, and from the information obtained compute the average yield per acre.

6. The judge shall be appointed by the Director of Agriculture and the judge's decision shall be final.

7. Nominations for this competition will be received by the Royal Agricultural Society not later than 15th October, 1928. On or before 1st November of that year, and during each succeeding year of the competition, the societies must submit the names of the farmers representing the district in this competition. If, through misfortune, any farmer nominated is unable to compete, a substitute may be nominated at any time prior to the completion of the judging in that district. Each year nominations must be accompanied by a fee of 25s. for each team.

The trophies have been presented for competition by the Cuming Smith and Mt. Lyell Farmers' Fertilisers Company, Ltd. The first and main trophy is a Challenge Shield which is valued at 20 guineas. On the completion of the competition this shield will become the property of the district society or association nominating the winning team of five farmers. On the shield will be recorded permanently the name of the winning society and the names of the farmers comprising the team. In addition the names of the districts who win it in any particular year, together with the names of the individuals comprising the team from that district that year will be shown. In addition to this shield the fertiliser companies are presenting the members of the winning team with a small replica of the shield on which will be inscribed the name of the district winning the yearly competition and each member of the team.

The judging of this, the first competition, was carried out by the officers of the Wheat Branch.

The results are as hereunder, the competing teams being placed in order of merit.

DISTRICT CHALLENGE SHIELD WHEAT YIELDS COMPETITION, 1928–29.

District.	Members of Team.	Acreage.	Yield.	
			Gross.	Average per acre.
			bushels.	bus. lbs.
Yandanooka	Neville, P. C.	313	9,900	31 38
Do.	Saunders, W. S.	238	6,760	28 24
Do.	Eckerman, H.	255	6,452	25 18
Do.	Duff, T	302	7,176	23 46
Do.	Wick, E. F.	291	6,490	22 18
		1,399	36,778	26 17
Gnowangerup ...	Davis, N. P.	337	9,952	29 32
Do.	Perkinson, A. W. ...	243	7,123	29 19
Do.	Garnett, J.	200	5,482	27 25
Do.	Johnson, A.	332	8,093	24 23
Do.	Chambers, E.	292	6,177	21 9
		1,404	36,827	26 14
Borden	Milne, M.	257	6,978	27 9
Do.	Bungey, R.	332	8,200	24 42
Do.	Murray, W.	201	4,900	24 23
Do.	McLennan, W.—Estate of	215	5,220	24 17
Do.	Moir, J.	200	4,197	20 59
		1,205	29,495	24 29
Three Springs ...	Bastian, A.	283	6,953	24 34
Do.	Glyde, K. S.	328	6,806	20 45
Do.	Thomas & Sons	567	11,692	20 37
Do.	Carter, R., & Sons ...	353	6,297	17 50
Do.	Broad, A. F.	605	9,524	15 45
		2,136	41,272	19 19
Kellerberrin ...	Lowe Bros.	400	9,153	22 53
Do.	Hammond, J. D.	305	6,426	21 4
Do.	Gibbs, R.	371	6,947	18 44
Do.	Southerland, B. & D. I.	563	10,103	17 57
Do.	Nicholls, H.	567	9,162	16 10
		2,206	41,791	18 56
Kulin	Henderson, J. H. ...	578	13,180	22 48
Do.	Johnson & Murray ...	404	8,202	20 18
Do.	Trotter, A. W.	409	7,003	17 7
Do.	Nichols, R.	669	11,148	16 40
Do.	Howe Bros.	321	4,923	15 20
		2,381	44,456	18 40

DISTRICT CHALLENGE SHIELD WHEAT YIELDS COMPETITION—*contd.*

District.	Members of Team.	Acreage.	Yield.	
			Gross.	Average per acre.
			bushels.	bus. lbs.
Lake Grace	Stevens, F.	273	6,677	24 28
Do.	Woodburne, J.	406	7,560	18 37
Do.	Coad, J.	410	7,555	18 26
Do.	McMahon, P. J.	427	6,622	15 30
Do.	Darby, A. H.	299	4,213	14 6
		1,815	32,627	17 59
Moulyinning ...	Wilson, A. F.	415	8,715	21 0
Do.	Hornsby, K. & S. ...	250	5,134	20 32
Do.	Clark Bros.	289	4,767	16 30
Do.	Mott, C.	461	7,517	16 19
Do.	Elder, A.	429	5,960	13 54
		1,844	32,093	17 24
Ogilvie	Lawrence, H. N.	383	8,590	22 26
Do.	Atkinson, A. G.	468	9,156	19 34
Do.	Hollis & Browne ...	425	7,458	17 33
Do.	Horan, A.	969	15,160	15 39
Do.	Carson, P.	825	11,889	14 25
		3,070	52,253	17 1
Bruce Rock ...	Mann, R.	543	9,620	17 43
Do.	Haggerty, H. J.	333	5,724	17 11
Do.	Stone, S. B.	540	9,170	16 59
Do.	Abraham, J. M. R. ...	665	10,165	15 17
Do.	Tibbs, J. A.	318	4,821	15 10
		2,399	39,500	16 28
Tammin	Uphill, G.	963	16,644	17 17
Do.	Mann, J. W.	378	7,306	19 19
Do.	Thomson, M.	621	9,994	16 6
Do.	Machin, C. C.	829	11,560	13 57
Do.	Hocking, A.	385	5,718	14 51
		3,176	51,222	16 8
Corrigin	Sainsbury, C. W. ...	274	4,920	17 57
Do.	Crossland, J. L.	791	13,899	17 34
Do.	Bremmer, J. R. & Sons...	1,124	16,839	14 59
Do.	Cronin, J.	671	9,585	14 17
Do.	Overheu, W. P.	651	9,302	14 17
		3,511	54,545	15 32
Nungarin	Williams, F. A.	483	8,042	16 39
Do.	Dawe, A. F. H.—Estate of late	290	4,738	16 20
Do.	Creagh Bros.	916	14,141	15 26
Do.	Warner, F. L.	627	8,741	13 57
Do.	Payne, H. G.	518	6,113	11 48
		2,834	41,775	14 44

DISTRICT CHALLENGE SHIELD WHEAT YIELDS COMPETITION—*contd.*

District.	Members of Team.	Acreage.	Yields.	
			Gross.	Average per acre.
			bushels.	bus. lbs.
Kukerin	Gard, T.	251	3,857	15 22
Do.	English, C.	808	11,688	14 28
Do.	Smith, J.	256	3,221	12 35
Do.	Harrison, W.	249	2,991	12 1
Do.	Ditchburn, R.	488	5,363	10 59
		2,052	27,120	13 13
Doodlakine, No. 1 ...	Fisher, A. J.	271	4,428	16 20
Do.	Mableson, H.	646	10,289	15 56
Do.	Spillman, D.	840	12,329	14 41
Do.	Spillman, J.	1,069	10,073	9 26
Do.	Birch, F.	639	5,506	8 37
		3,465	42,625	12 18
Mt. Marshall ...	Cook Bros.	372	5,178	13 55
Do.	Shemeld, H. G.	498	6,867	13 47
Do.	Shields, L. M. N. ...	502	6,250	12 27
Do.	Purdom, P.	743	8,633	11 37
Do.	Green, A. E.	1,120	11,648	10 24
		3,235	38,576	11 55
Bunketch–Burakin ...	Davis, J. B.	555	8,566	15 26
Do. ...	Thompson, W. E. ...	354	4,629	13 5
Do.	Knapp, H. ...	399	5,028	12 38
Do.	Thompson, R.	581	5,847	10 4
Do.	Roche, J. J., & Sons ...	957	9,432	9 51
		2,846	33,502	11 46

THE FUR RABBIT.

C. J. CRAIG.

Any mention of a new wool bearer instantly commands the interest of Australians. The French breed of rabbit was first mentioned in England when Louise, Duchess of Portsmouth, a favourite of the Merry Monarch, brought over some pets which a chronicler of the time referred to as "monstrous furry creatures."

Probably few of our readers realise the immense hold which the domesticated rabbit has obtained on the fur markets of Great Britain, France, United States, etc. Not only does it supply a far larger proportion of the furs offered than any other animal, but it is steadily reducing the number of its competitors by the strange process of producing almost exact copies of their furs at far more moderate prices. The Chinchilla rat at £20 came into competition with the Chinchilla rabbit at 15s., and disappeared. The marten has met with the same fate, the sable seems likely to follow suit, and now it appears that "Brer Fox" is seriously challenged by his old adversary. New types of rabbits are constantly being evolved, but by far the most remarkable of recent successes is the "Chifox," which was exhibited at a rabbit show recently opened at Westminster by the Minister for Agriculture.

For twelve years Mr. Milsum, a well-known breeder, has been aiming to produce a fur between that of the more costly varieties of fox and the Siberian hare. His success is demonstrated by the appearance of the Chifox, which is described as a rabbit with a long, dense fur of great beauty especially suitable for trimmings. The Chifox can be produced in any one of seven fixed natural colours, viz., grey, white, squirrel, sable, silver-backed, smoke beige, and blue. The pelts extend to 19in. when dressed. Another novelty at the same show was the "Chinchillarex," which is a much improved Chinchilla with a coat so close-haired as to be almost velvety in texture, and from which the long "guard-hairs" which have to be pulled out before an ordinary fur is made up, have been completely eliminated by scientific breeding. The official report complains that "such rabbits are too expensive, costing as much as £15 a live rabbit, to be used for pelting," but probably the breeders are not dissatisfied. There are, unfortunately, no statistics obtainable regarding the number of fur-rabbit breeders in Britain, but it must be very large, since the British Fur Board (fur boards are co-operative associations formed, under Government auspices, to tan, sort, and sell the pelts sent in by small scale owners only) had over 2,500 members last year, and similar boards have been established in Scotland and Ireland, but by no means all small owners join them, many preferring to dispose of their pelts to furriers direct. Many of the large rabbitries will purchase pelts, and some of them have instituted what is known as the "buy back" system, under which any approved person can purchase does in kindle or breeding trios at special rates, the vendor agreeing to buy all progeny at a fixed price when they reach the pelting age. With those whose employment takes them away from home for the greater part of the day, the fur rabbit is more popular than the Angora, since it requires much less attention, in fact two good meals a day and a clean, airy hutch are all that it needs. Australia, which actually imports some £400,000 worth of furs, should prove an excellent market for New Zealand, and, no doubt, the fur breeders and furriers in the Dominion pray that the Commonwealth may long retain the proud position of the only country in the world to prohibit the introduction of fur and wool-bearing rabbits.

MARKET REPORT.

Messrs. H. J. Wigmore & Co., Ltd., of 613-619 Wellington Street, Perth, have supplied us with the following information regarding chaff available at the metropolitan chaff and grain auction sales held in Perth for the period March to May, 1929 (inclusive). In all cases the prices quoted are for f.a.q. to prime wheaten chaff, packed in new bags:—

March—Quantity, 1,050 tons; maximum, £6 10s. per ton; minimum, £6 5s. per ton.

April—Quantity, 1,690 tons; Maximum, £6 5s. per ton; minimum, £5 10s. per ton.

May—Quantity, 1,200 tons; maximum, £6 10s. per ton; minimum, £5 12s. 6d. per ton.

During March supplies available were not heavy, and the market remained steady, f.a.q. to prime realising £6 10s. per ton, but in April heavy yardings were arriving and values eased to £5 12s. 6d. per ton, and in several instances as low as £5 10s. In May, owing to the extremely wet weather experienced, yardings were lighter and the market firmed, f.a.q. to prime selling at from £6 5s. to £6 10s. However, during the past week or two, prices have again fallen, the following being closing quotations:—

F.a.q. to Prime—£5 7s. 6d. to £5 10s. per ton.

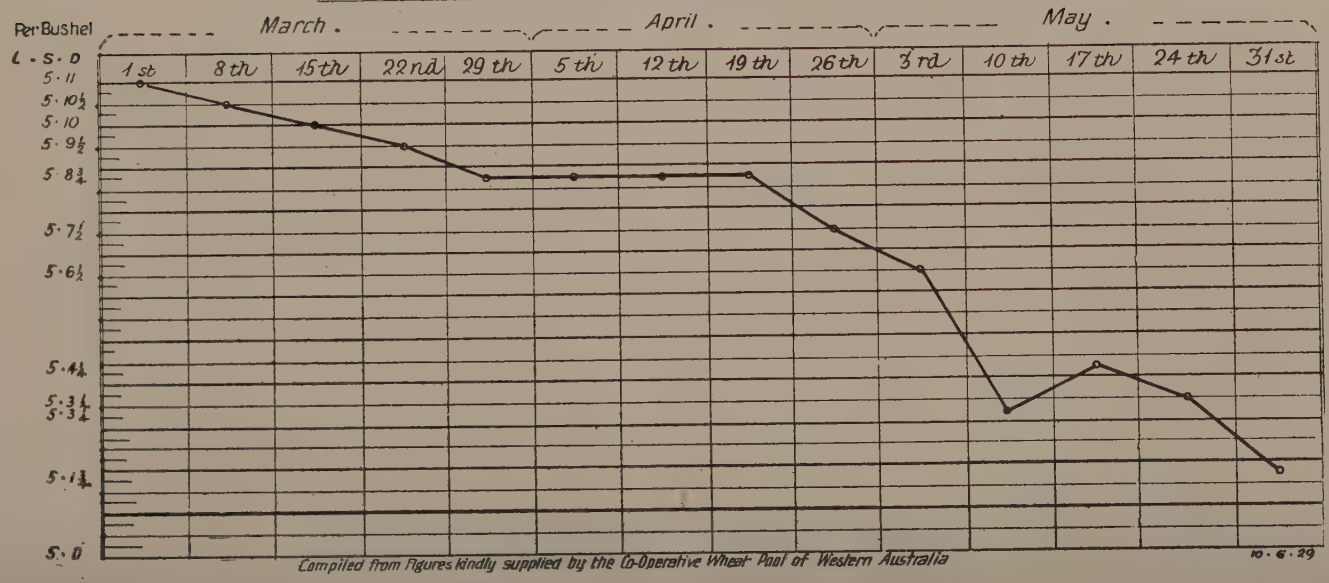
F.a.q.—£5 to £5 2s. 6d. per ton.

Mediums—£4 12s. 6d. to £4 15s. per ton.

Oaten Chaff.—During March and early April very few consignments of prime quality were coming to hand, and this was in request at from £6 to £6 5s. per ton. However, at the latter end of April, under weight of supplies arriving, the market eased, prime samples selling at from £5 10s. to £5 12s. 6d.; f.a.q., £5 to £5 5s.; but in May, in sympathy with wheaten, the market firmed a little, f.a.q. realising up to £5 15s., mediums £4 15s. to £5., there being practically no consignments of prime quality available.

Oats.—Right throughout the period under review good heavy feed samples have been firm at from 3s. 1d. to 3s. 3d. per bushel. Prices now, however, are not quite so satisfactory, good heavy feeds realising from 2s. 9½d. to 2s. 10s., light feeds 2s. 7d. to 2s. 9d., and it is not likely that any improvement in this market will be forthcoming for some considerable time.

Wheat.—In sympathy with the overseas market, local values have eased considerably, f.a.q. selling during the last week or so at from 4s. 5d. to 4s. 6d. per bushel; other qualities at lower prices according to sample.


Return of Wheat Prices Per Bushel
C.I.F. & E. London.
Per Bushel
March.
April.
May.
L. S. D
5. 11
5. 10½
5. 10
5. 9½
5. 8¾
5. 7½
5. 6½
5. 4¼
5. 3¼
5. 3¼
5. 1¾
5. 0
1st
8th
15th
22nd
29th
5th
12th
19th
26th
3rd
10th
17th
24th
31st
Compiled from figures kindly supplied by the Co-Operative Wheat Pool of Western Australia
10. 6. 29

LIVE STOCK AND MEAT.

For the information of readers of the "Journal," the following particulars have been supplied by Messrs. Elder, Smith & Co., Limited, Perth:—

COMPARATIVE YARDINGS OF STOCK YARDED AT METROPOLITAN FAT STOCK MARKETS FOR MARCH, APRIL, AND MAY, 1929.

	MARCH, 1929.				APRIL, 1929.				MAY, 1929.				
	6.	13.	20.	27.	3.	10.	17.	24.	1.	8.	15.	22.	29.
Sheep and Lambs	12,674	10,614	11,687	10,740	10,812	9,904	11,456	13,265	12,323	8,779	9,321	9,660	9,745
Cattle ...	579	556	474	180	298	468	297	517	566	643	407	823	690
Pigs ...	769	430	503	526	640	639	665	535	593	581	590	437	438

COMPARATIVE VALUES PER LB. OF STOCK SOLD AT METROPOLITAN FAT STOCK MARKETS DURING MARCH, APRIL, AND MAY, 1929.

	MARCH, 1929.				APRIL, 1929.				MAY, 1929.				
	6.	13.	20.	27.	3.	10.	17.	24.	1.	8.	15.	22.	29.
	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.
Mutton ...	7¾	7¾	8	8½	8½	9¼	9¼	8½	8¼	10	10¼	10½	10
Beef ...	9½	9½	9½	9½	10	9½	8¾	7½	8½	8¼	8¾	8½	8¼
Pork ...	11½	12	12	12¼	12½	13	13	13	13	13	13	13	13½
Bacon ...	10	10½	10½	10½	10½	10½	10½	10¾	10½	10½	10½	10½	10¾

METEOROLOGICAL INFORMATION.

STATIONS.	TEMPERATURE.				RAINFALL.		TEMPERATURE.				RAINFALL.		TEMPERATURE.				RAINFALL.	
	Maximum.		Minimum.		For Month.	Average.	Maximum.		Minimum.		For Month.	Average.	Maximum.		Minimum		For Month.	Average.
	Mean.	Highest.	Mean.	Lowest.			Mean.	Highest.	Mean.	Lowest.			Mean.	Highest.	Mean.	Lowest.		
	MARCH, 1929.						APRIL, 1929.						MAY, 1929.					
					inches.	inches.					inches.	inches.					inches.	inches.
Chapman Farm ... State ...	89·8	102·0	60·6	43·0	0·20	0·69	82·7	95·8	54·8	46·7	0·10	0·45	71·3	84·3	53·0	46·9	4·24	2·31
Geraldton	85·0	94·0	64·0	54·0	0·01	·47	78·6	98·0	58·3	50·2	0·06	·84	72·2	85·2	59·4	52·0	4·29	2·79
Walebing	83·2	100·2	57·5	47·0	0·81	·76	78·9	94·0	50·5	42·4	0·17	·79	66·1	77·9	48·8	41·1	5·31	2·50
Perth	80·9	93·2	59·7	50·4	0·09	·80	73·6	92·1	54·9	45·0	1·20	1·64	66·5	77·2	53·2	45·6	11·50	4·97
Kalamunda	79·7	93·0	56·6	46·0	0·18	·90	72·6	88·5	53·3	39·0	0·79	1·93	64·5	78·0	50·4	44·0	12·28	5·91
Bunbury	78·5	88·2	52·4	44·2	0·44	1·02	71·1	83·8	48·6	37·2	1·02	1·74	66·3	77·5	50·8	39·2	5·33	5·30
Bridgetown	81·5	93·2	48·2	34·0	1·66	1·04	74·4	91·8	45·7	35·0	2·73	1·70	64·5	76·2	43·9	32·8	8·41	4·54
Albany	68·8	80·6	57·4	52·0	0·83	1·56	68·2	83·0	53·5	46·0	3·15	2·74	63·9	73·6	49·4	39·0	4·12	5·04
Merredin Farm State ...	80·7	98·2	57·2	45·1	0·77	1·01	77·0	94·0	49·9	39·6	0·00	·76	63·2	75·4	49·2	37·2	3·57	1·22
Northam	83·4	100·0	57·5	47·8	0·70	·73	77·7	92·3	49·9	40·2	·13	·81	65·9	77·8	49·1	39·2	3·68	2·19
York	82·5	99·0	55·2	45·0	0·50	·65	77·2	90·2	48·6	38·0	0·08	·83	65·5	75·2	48·0	36·0	3 05	2·30
Narrogin Farm State ...	78·8	95·0	51·2	41·0	0·10	·79	71·9	85·2	46·5	36·0	0·46	1·18	61·6	71·2	44·7	36·0	4·71	2·76
Katanning	77·6	93·7	52·6	41·3	0·11	·98	71·2	85·4	47·0	35·3	0·46	1·19	62·1	72·0	45·8	35·0	4·82	2·28
Cape Leeuwin ...	70·7	82·0	59·3	53·2	0·83	1·26	67·7	88·0	58·3	50·0	3·29	2·15	64·6	72·5	54·1	42·0	10·59	5·63

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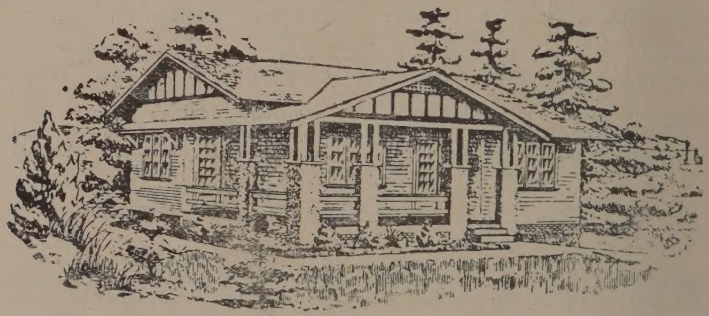

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